

Univel appoints Com Tech

The introduction of the long-awaited Univel UNIX product has taken yet another step towards fruition with the appointment of Com Tech as the first Australian distributor and the release of more product details.

The UnixWare product range will include a Personal Edition, an Application Server and a Software Development Kit.

UnixWare is based on the latest UNIX release from USL, System V Release 4.2 (SVR4.2), and provides multi-tasking capabilities across a broad spectrum of environments and applications.

According to the Regional Director of Univel, Brad Jelfs, UnixWare will have a major impact on the market in a number of areas.

"Because Univel brings the very best of both Novell NetWare and the latest UNIX technology together into one shrink-wrapped, easy-to-use product, it will have significant benefits for a wide range of users.

"With UnixWare, users have

the capability to access multiple concurrent Windows, DOS, UNIX and NetWare applications with a choice of Motif or OpenLook graphical user interfaces.

"Univel's confidence in the market success of the UnixWare family has been greatly strengthened by the fact that a significant proportion of the worldwide networking customer base has expressed a wish for the very capabilities and features which the product provides.

"It is estimated that more than half the installed NetWare base is interested in integrating a UNIX-based application or is investigating its interoperability with existing UNIX-based hardware platforms. It speaks volumes for the market scope of UnixWare."

Com Tech Managing Director, David Shein, has also expressed confidence in UnixWare and is looking forward to the opportunities it presents.

"Our long-standing commitment to Novell and its products and

services makes the decision to distribute UnixWare an obvious one.

"With our large UNIX and NetWare customer base, UnixWare complements our existing market position. We share Univel's belief that its major success will be in the fact that it provides the very networking facilities which users have been seeking in Novell/UNIX environments.

We are genuinely excited about the prospect, and looking forward to working with Univel as their premier Australian distributor.

"The fact that UnixWare is based on UNIX SVR 4.2 gives it significant advantages over products based on any previous UNIX version. When you add to this Novell's marketing expertise, industry reputation and level of technological excellence we are confident that the product will be a major market success. We are looking forward to playing an important role in that venture"

RED TURNS A SHADE OF ORANGE

INCREASED PERFORMANCE
INCREASED SERVER MANAGEABILITY

Com Tech will be the distributor of Compaq's NetWare in Australia which further enhances the commitment to the strategic alliance between the two organisations. Compaq selected Com Tech as the distributor for its new product range based on Com Tech's sales and support expertise in the NetWare market and its existing relationship with the Compaq reseller channel.

"Com Tech has been a leading player in the networking market in Australia over the past five years, and during this time they have continued to offer a high level of technical support and expertise to the industry as a whole," said Inge Fuglestad, Marketing Director Compaq Australia. "Part of our commitment to the Australian market is to continue to develop our partnerships with wholly Australian-owned organisations, such as Com Tech."

August will see the release of industry-standard Novell NetWare with complementary COMPAQ server management products and integration tools. These products, in conjunction with COMPAQ hardware, help customers take control of their network resources and reduce the cost of network administration.

The new NetWare v3.11 product from Compaq includes the following components: industry-standard NetWare, Performance Management TechNote, and NetWare programs from Compaq. Complementing NetWare v3.11, Compaq is offering COMPAQ INSIGHT Manager suite of server management tools and NetWare Services Manager (NSM) from Compaq.

The NetWare Programs diskette from Compaq contains the optimised drivers developed by Compaq to take advantage of advanced COMPAQ subsystems in NetWare environments.

The products that Compaq is introducing make NetWare servers based on COMPAQ hardware address a key problem in today's network environments, the need to reduce time and manpower spent on server and network administration, by enabling businesses to run their information systems more efficiently and cost effectively

COMPAQ

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FROM THE EDITOR



If there were a Euphemistic Society of Australia (ESA) (a close relative of the ASA - Acronym Society of Australia), the computer industry would surely be a leading patron with its unswerving commitment to extolling even the most flawed argument in a positive light.

I noticed with interest the other day that the new word for "downsizing" is "rightsizing". Someone must have decided some harmful connotations had been associated with their "downsizing" solution so they replaced a euphemism with a euphemism.

However, one new word which goes beyond euphemisms is the term "open", as it is used in "open systems". Here is a term no one can define. Take for example the many discussions in the media on "open systems" by industry experts. No two experts have matching opinions nor do they seem sure of their own, although all agree it is a desirable goal. Each expert points to particular concepts such as adherence to standards, portability or interoperability.

The quote for me that provides the essence of what the open systems concept refers to comes from Peter Cunningham, President and CEO of UNIX International, one of the largest consortiums pushing the "open systems" barrow, "An open system is ultimately one that offers a choice of technologies which compete in a free marketplace".

As an extension of this the "open systems" movement is ultimately being driven by end-users who demand the best applications on their choice of platforms. For a supplier such as Com Tech being an "open systems specialist" takes this requirement a step further. It means providing industry leading products backed by the networking knowledge necessary to connect them in the most efficient and seamless manner possible ☐

UNIX-the Open Operating System

Open Systems is a user movement that is taking the industry by storm. For a long time, UNIX has been considered synonymous with Open Systems, presenting users with an "open" operating system as a result of its vendor independence.

In a bid to evaluate the role of UNIX in the move to Open Systems, it is important to establish exactly what Open Systems means.

Open Systems is a concept and not a tangible product that you can buy. It is typified by a pooling of computing environments that allow users to build the most appropriate solution to meet their business needs by selecting from a variety of products and tools developed by the myriad of hardware and software vendors. There is no such thing as an Open Systems product - some products simply facilitate an 'Open Systems' approach to computing more than others.

It is true, however, that products that implement standards (like UNIX) and concepts such as portability and interoperability, are important because they assist users in creating their own "open" environment.

UNIX, as an operating system, is a sophisticated technology. It is made up of a series of standards, source definitions and implementation definitions that create a technology base with a common look and feel. Vendors take this "open" technology and develop products from it with their own additions and extensions. While this may make some versions of UNIX appear less open, the essential core of the operating system for all versions of UNIX is the same.

This is largely due to the number of important standards that have been established to ensure UNIX maintains its look and feel. The first is the System V Interface Definition (SVID) which details the base operating system and overall look and feel of the UNIX technology.

SVID is a standard maintained by AT&T that defines the base

system and kernel extensions, basic and advanced utilities and communications issues such as STREAMS Support.

POSIX comprises a number of working groups of industry specialists controlled by the Institute of Electrical and Electronics Engineers (IEEE) that has been set up to produce a series of portability guidelines for Open Systems using UNIX as the base reference model. The POSIX 1003.1 definition covers the interface between an application and the underlying operating system, providing a guideline for source code portability between platforms.

The final group is X/Open, a group of companies that have created a series of portability guides called XPG. XPG3, the current revision, is not confined to the UNIX arena but attempts to define a common multi-vendor applications environment where application developers can produce products across a range of different platforms and environments while maintaining continuity throughout.

These standards have produced two unique advantages for the UNIX operating system - scalability and portability. As an operating system, UNIX is available across a wide range of platforms, from Intel-based PCs to very large mainframe systems. The main benefit for the user is that each version of the operating system has a similar look and feel and allows the same applications to run across the entire range. In other words, UNIX allows the user to protect investment in technology and plan for the future by insuring a flexible growth path.

However, an operating platform is not an island and needs to be able to communicate and interoperate with other like-minded systems and also dissimilar environments. Communication standards such as TCP/IP and NFS provide this facility allowing organisations to

seamlessly integrate IBM and DEC environments, for example.

UNIX vendors have increasingly adopted TCP/IP and NFS as the de-facto networking technologies for their platforms. Utilising TCP/IP and NFS, a computer system made up of a wide range of different hardware and UNIX variants can transparently share resources and applications regardless of the underlying platforms.

As technology develops, the underlying operating system will become less of a concern for people implementing Open Systems. The standards that are being adopted now will ensure that applications will be available for the hardware platforms of their choice.

In the UNIX environment, there are emerging standards in the implementation of Graphical User Interfaces (GUIs), for example, that will ensure the smooth integration of increasingly popular Windows applications.

Indeed, UNIX vendors have universally implemented the X11 graphics protocol from MIT (Massachusetts Institute of Technology) which allows a graphical image to be displayed on any graphics device without the need for the application to be aware of the resolution of the display it is using. Other standards such as Motif and Open Look define the look and feel for the graphical application, giving a user a common interface to all their applications, whether they are running on a PC or a mainframe.

Whilst there may be many different versions of UNIX available, providing products that conform to standards such as those mentioned above is the key to the successful implementation of flexible "open" computing environments that can maximise the computing potential for all of its components ☐

B R A N C H R E P O R T

SA Adelaide branch moves to new Wayville offices.....Martin Thorpe joins as Technical Support Manager.... **QLD** Brisbane office moves to larger premises in the heart of the city....new training centre and display room demonstrates commitment to region....Chris Ryan joins Brisbane Team as Network Support Specialist for Novell....Alan Beall brings UNIX knowledge to office as Network Support Specialist for UNIX....**WA** Perth operation installs own network to improve inter-office and inter-State communications.....training expertise extended with appointment of Brett Looney as SCO Instructor.....Keith Jeffers completes LAN Workplace, TCP/IP and NFS Instructor courses and expands training courses in WA....Mike Kloak joins as Dealer Account Manager.... **VIC** ISDN link to Sydney office is now fully functional.

Efficiency and integrity drive RTA

The New South Wales Roads and Traffic Authority (RTA) has invested \$39 million in a new computer network which has dramatically cut the time required to process licence applications and car registrations.

The new infrastructure, known as DRIVES, is believed to be the largest Unix-based on-line transaction processing system in Australia and one of the largest Unix mainframe systems in the world. It provides network facilities to all 136 Motor

engaged the services of Com Tech who supplied the SCO Unix System V Release 2 Operating System, TCP/IP and Racal InterLan Ethernet Adapters for installation in the 1,500 Olivetti M290S diskless PCs.

Previously, the RTA used a batch system which meant all transactions had to be entered at their head office at Rosebery in Sydney, a process which often took several days.

customer can be accessed at the one time," he said.

The new system has equipped each Registry with a 386 computer which links, via an X.25 wide area network, to the new Fujitsu 1800 at the RTA's Communications Centre in Flemington. In case of communication line failure, the registries are bridged in pairs using the ISDN network to provide redundancy.

The 386 computers provide

and the RTA the comprehensive resources that we are able to offer."

The Olivetti workstations are connected to OCR Readers for scanning forms and to Olivetti PR50 specialised point-of-sale printers which combine flat-bed printing with journal-role facilities.

These specialised machines allow Registry staff to print interim licences and receipts quickly and inexpensively, while also maintaining a comprehensive log of all documents produced.

"The new system taps into a huge Oracle database which stores details of the 3.4 million licences and 3.7 million vehicle registrations held in NSW. The database holds around 60-70 gigabytes of information," said Michael McMullan.

Mr McMullan claims the on-line network has greatly improved efficiency because records are able to be updated immediately, rather than waiting a week for the results of a batch update job run.

The system has also significantly reduced errors such as entry duplication by allocating a customer number which uniquely identifies each person.

"DRIVES is a rule-based system and is therefore much more accurate than the old batch system. This is because it won't let people do things they're not allowed to. Once the data is in there all the rules have been complied with, whereas with a batch system you can have incorrect data," explained Mr McMullan.

The project involved over 50 tonnes of equipment, including 6,000 boxes and 15 kilometres of thin Ethernet cable.

"The installation was a

logistical nightmare as all the wiring and set up had to be done after hours, in preparation for the switch over last September," said Michael Toohey.

"Our Equipment Preparation Department configured and tested every product to be used in the network here in our Sydney office before the installation began.

"Then a team of up to 30 technicians worked over a period of several weeks to lay the cable, install all the PCs and peripherals and ensure everything was functioning properly.

"We had technicians working in Registry Offices until after midnight on occasions, or travelling from town to town over the weekend, in order to cover as much ground as possible in the limited time frame," he said.

During the same period, Telecom installed around 40 ISDN links between metropolitan and regional offices to provide increased fault tolerance in the network.

In all, the installation of the system totalled 150 man years, incorporating the design and development of the software and the implementation and training of 1,500 RTA staff.

According to Mr McMullan, the RTA staff have responded very positively to the new system.

"The staff like the control and knowledge the system gives them. They are able to complete the transaction for the customer themselves and can access the information they need quicker and easier than before. They are also less likely to give wrong information because the system is guiding them," he said.



Registry offices around NSW.

The licensing system went live in September 1991 and allows licence applications to be processed on-site, significantly reducing transaction time.

"Since its installation, customer service has improved remarkably given the streamlining of licence processing," said RTA's General Manager, Business Systems, Mr Michael McMullan.

Motor vehicle registrations came on-line in June this year following conversion of data from the old system to the new and completion of an extensive quality assurance process.

"Now we're satisfied with the integrity and accuracy of the data, the RTA is in a position to offer customers 'one stop shopping' within their offices," said Michael McMullan.

host facilities for up to 33 Olivetti M290S 286 workstations which function as point-of-sale terminals in each location for processing transactions, updating records and accessing information.

The Olivetti workstations run at 16MHz and are configured with 1MB RAM and a Racal InterLan NI6510 Ethernet Card containing the Unix boot in ROM, allowing the diskless PCs to be booted across the TCP/IP network to the Unix server.

"We believe this is the first time this had been possible. In fact, Com Tech had to go back to Racal InterLan and explain what we wanted to do. They then worked closely with both Com Tech and a small German company to develop the technology we needed," said Olivetti's National Projects Manager, Mr Michael Toohey.

According to Chris Martin, Com Tech's Unix Division Manager: "The bootp ROM provided the RTA with the security and flexibility they required for the DRIVES system and provided Com Tech with an opportunity to show both Olivetti

"The benefits are not limited to the customer either. The RTA has experienced significant operational cost savings since installing DRIVES"

"The benefits are not limited to the customer either. The RTA has experienced significant operational cost savings since installing DRIVES," he said.

In installing the system, Olivetti

"Registration and licence transaction are now possible at the one terminal. This means better service to customers and an increased accuracy of records, given that all available information about a single



NEW WORKSTATION CONNECTIVITY TOOL FOR NETWARE

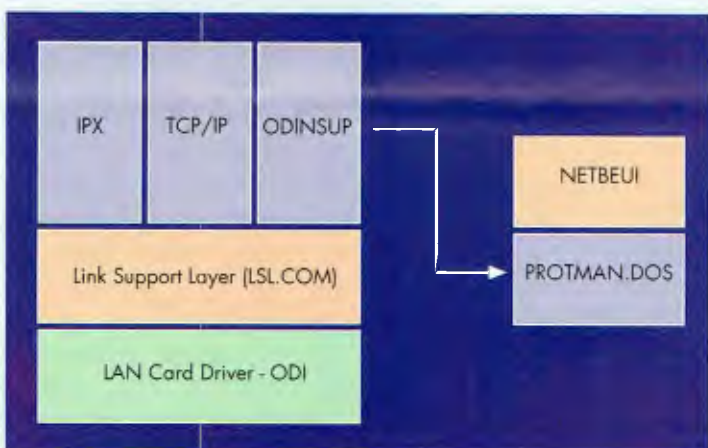
Novell has announced a new supplement for NetWare called ODINSUP (ODI/NDIS Support) which allows NetWare users to connect to dissimilar networks from the same workstation.

Designed to address one of the hottest issues in networking - multiprotocol network connectivity - it bridges the gap between the prevailing standards for simplifying multiprotocol support on different brands of network interface cards. These are Novell's ODI (Open Data Link Interface) and Microsoft's NDIS (Network Driver Interface Specification) which are currently supported by a range of software vendors.

Novell's Open Data Link Interface (ODI) is the basis of NetWare and has support from most major network card manufacturers. NDIS is the basis of LAN Manager, Banyan Vines and LAN Server and also has support from most card manufacturers. While these two specifications achieve essentially the same objective, until now could not co-exist.

ODINSUP makes it possible for a user to connect, for example, to a NetWare file server and a LANServer file server and run applications and access files as if they were on the one LAN.

ODINSUP supports only ODI LAN drivers for Ethernet and Token Ring cards. The supplement is available from Novell Authorised Resellers free of charge.



NOVELL ENLISTS DATA CLUB AS ENHANCED MACINTOSH FILE SERVER

Novell's recent acquisition of International Business Software Ltd and its sophisticated distributed computing software program, DataClub, provides Macintosh users with the high performance of a dedicated file server, with or without dedicated server hardware.

Dataclub, a distributed file system for the Macintosh, uses disk space from participating members of a Macintosh workgroup to form an integrated virtual server. The virtual server mounts as a single volume on the desktop of participating Macintosh computers.

DataClub Classic combines the economy of peer-to-peer networking with the simplicity of a dedicated server network for small Macintosh workgroups.

With DataClub Elite, one or more Macintosh computers can be dedicated to be part of the distributed server for even higher performance and ease of administration.

Recent benchmark comparisons conducted by computer trade press touted DataClub Elite as the most powerful Macintosh server software for networks that connect large numbers of users with sophisticated computing needs.

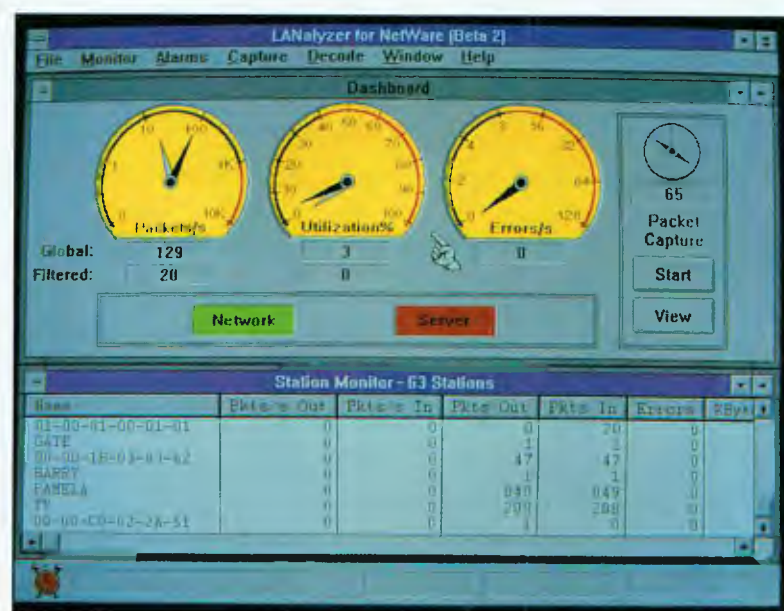
Both DataClub products implement all features of AppleShare 2.0.1 and comply with the AppleTalk Filing Protocol (AFP).

Entry Level LANalyzer provides management for everyone

While Novell's LANalyzer 3.11A provides advanced trouble shooting capabilities for low level network problems, it requires an operator with considerable experience to correctly interpret the data. Novell has realised there is also a need for a network management tool that is easy to use and interpret, but that also provides a more general level of protocol analysis. LANalyzer for NetWare is that product.

LANalyzer for NetWare combines network monitoring and analysis in a Microsoft Windows-based application. The graphical user interface provides an easily understood view of network statistics and features a unique "point and click" filtering system. It includes specialised test and diagnostics for the NetWare environment, including complete seven layer protocol decodes for all versions of NetWare, as well as AppleTalk Phases 1 and 2.

LANalyzer for NetWare can be used as a network troubleshooting tool, a real-time monitoring system, an in-depth statistical analyser and a network growth planner. The product runs



on any 80386 or higher DOS-Windows workstation and can analyse traffic on any type of Ethernet (10BASET, 10BASE2 or 10BASE5).

"NetWare users tell us they need to supplement their server management and workstation diagnostics with a tool that lets them manage the NetWare environment as a whole", said Darron Lonstein, Com Tech's Technical Services Director.

"LANalyzer fills this need and gives systems administrators the first affordable, easy-to-use management and analysis solution for NetWare networks. It takes network monitoring and troubleshooting out of the realm of network or protocol specialists and makes it available to all NetWare administrators. It's the first management tool anyone who administers NetWare networks should consider buying."

NOVELL BOOSTS HOST CONNECTIVITY

Novell has re-affirmed its commitment to host connectivity and UNIX in particular with its latest release of TCP/IP based software. The announcement consists of three products which greatly increase the functionality provided to NetWare users when interacting with host systems.

NETWARE FLEX/IP

Novell's NetWare FLeX/IP software is a set of TCP/IP utilities providing connectivity between UNIX systems and the NetWare 3.11 environment. The package provides a bi-directional print gateway that allows users to spool print jobs to any NetWare printer via their native "lpr" commands. NetWare FLeX/IP also allows NetWare users to print to UNIX printers.

FTP services are also provided allowing UNIX users to transfer files between UNIX hosts and NetWare 3.11 file servers using traditional FTP commands. The NetWare 3.11 file server can also act as an FTP gateway to other NetWare file servers on the network, including those that do not support TCP/IP. Both the printer and FTP services are provided via NLM's loaded on the NetWare 3.11 file server.

The X11 remote console allows network administrators to manage NetWare 3.11 servers from any X-Window system. The XCONSOLE is a NetWare

Loadable Module that displays NetWare 3.11 console using X-Windows

CLIENT ADD-ONS FOR LAN WORKPLACE DOS

In an announcement that significantly increases the market coverage for LAN Workplace for DOS, Novell has released two add-on clients that provide NFS and IBM 3270 connectivity.

NFS Client for LAN Workplace provides users with seamless connectivity to NFS file servers and printers on a TCP/IP network. It gives DOS and Windows users transparent access to files on remote NFS servers, as if the files were on a local hard drive. Users can also take advantage of UNIX printers by directing DOS printer ports to UNIX printer queues.

NFS Client works concurrently with NetWare and is topology independent. Files can be open on NFS/UNIX and DOS/NetWare drives at the same time in either an Ethernet or Token Ring environment. The product also includes add-on services such as QUOTA, CHGRP, CHMOD, NET GROUP and LS.

The TN3270 for LAN Workplace for DOS option enables users on a TCP/IP network to login to IBM mainframes running MVS or VM operating systems. Users can run applications without modification as if the users PC was an IBM 3278 terminal.

The product gives users a choice of TN3278 terminal models 2 through 5 and allows multiple sessions to multiple hosts. Users can perform functions such as screen capture, print-to-disk and file transfer and can access extended feature attributes such as blinking, highlighting and reverse video.

Become a Novell Certified NetWare Engineer (CNE) with Com Tech

The Novell Certified NetWare Engineer (CNE) program was first launched in Australia in 1990. With the current number of CNEs rapidly approaching 1000, the CNE certification rates highly on the list of computer networking qualifications. Both resellers and end users are realising the benefits of having a CNE "on board" and so industry demand for CNEs has increased dramatically.

To become a CNE with Com Tech, candidates need to accrue at least 19 credit points by attending a number of courses and then passing a series of examinations.

The prerequisites for beginning the CNE program are a basic working knowledge of Novell NetWare, a good working knowledge of DOS and microcomputer hardware and solid base knowledge of computer communications.

CNE: Course Structure

- NetWare v3.11 System Manager
- NetWare Service & Support
- NetWare v3.11 Advanced System Manager
- Networking Technologies

CNE examinations are conducted by Drake International Testing Services at a cost of \$100 per examination. The facilities at

Drake allow CNE candidates to book into an examination any time during normal business hours.

To make bookings, please contact Karen via the Drake Testing Hotline on (008)800-430. Novell has set pass rates for the examinations at 80%. However, participants who have attended Com Tech training courses may often achieve better than average results.

CNE examinations are all computer-based and multiple choice, based around the course structure. Novell's new "Adaptive Testing" methods use results from over 3000 other candidates to intelligently evaluate a candidates knowledge in the quickest and fairest way.

Com Tech has developed a number of special CNE courses that provide students with a course structure to suit their needs:

COMPRESSED CNE PROGRAM
The Com Tech COMPRESSED CNE Program is run over ten consecutive working days. It is important to note that candidates attending the COMPRESSED CNE program should have a basic working knowledge of NetWare before attending the course.

EVENING CNE PROGRAM
The Com Tech EVENING CNE Program is run over 20 evenings from 6.00pm - 9.30pm. The material covered is identical to that of the COMPRESSED CNE Program. Please refer to the latest Com Tech training schedule for the dates in your State. Typically, the EVENING CNE Programs run two to three nights per week.

EXPRESS CNE PROGRAM
The Com Tech EXPRESS CNE Program is a five day training course designed for highly experienced Novell Engineers wishing to prepare themselves for the CNE examinations without wasting time on topics with which they are already familiar.

The full set of student manuals is provided and the review exercises at the end of each chapter are studied to ensure there are no gaps in the student's knowledge.

It is imperative that students attending the EXPRESS CNE program have had a minimum of two years hands on experience with Novell networks and have installed NetWare versions 2.15, 2.2 and 3.11.

They must also be familiar with over 70 - 80 per cent of the syllabus for each course covered in the program. Generally, students may scan the course descriptions for each course to assess their familiarity with the syllabus.

Students are asked to sign a declaration testifying their level of experience before being confirmed on an EXPRESS CNE program.

REGULAR CNE PROGRAM
The Com Tech REGULAR CNE Program is designed for students who wish to spread their CNE training over a period of time. To attend the REGULAR CNE Program and take advantage of the special CNE pricing, candidates must enrol in the courses listed in Com Tech's training schedule. The order in which the courses are attended is not important providing NetWare v3.11 System Manager is attended first



TRAINING TRAINING TRAINING TRAINING

CNE August-September Training Schedule



Certified NetWare Engineer (CNE) COMPRESSED - 10 days			
MONTH	DATES	VENUE	RRP \$
Aug	10-21, 7-18 Sept	Syd	3,500.00
Sept	24-28, 31-4 Sept	Bris	3,500.00
Sept	7-11, 14-18	Melb, Adel	3,500.00

Certified NetWare Engineer (CNE) EXPRESS - 5 days			
MONTH	DATES	VENUE	RRP \$
Aug	3-7	Syd	2,500.00
Aug	31-4 Sept	Melb	2,500.00
Sept	7-11	Canb	2,500.00

Certified NetWare Engineer EVENING - 20 evenings 6:00 - 9:30pm			
MONTH	DATES	VENUE	RRP \$
Aug	3, 4, 5, 10, 11, 12, 17, 18, 19, 24, 25, 26, 31	Syd	3,500.00
Sept	1, 2, 7, 8, 9, 14, 15		
Sept	1, 2, 7, 8, 9, 14, 15	Melb	3,500.00
Oct	1, 6, 8, 13, 15, 20, 22, 27, 29		
Nov	4, 5, 10, 12		

ENTERPRISE CNE extends NetWare Qualifications

The ENTERPRISE CNE (ECNE) qualification is one of the highest Novell qualifications available. It is designed to educate system administrators and support staff in Novell's specialised add-on products such as NetWare NFS and NetWare SAA.

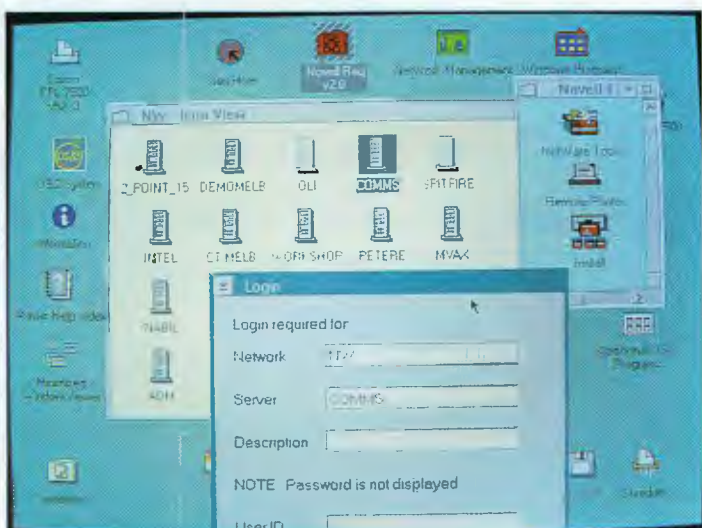
Com Tech is one of the first Novell Authorised Education Centres in Australia to start running

courses which prepare candidates for the ECNE examinations.

Essentially ECNE candidates need to have a CNE qualification and accrue 14 credit points from a range of "elective" subjects specified by Novell. ECNE candidates who have attended Com Tech's new CNE program will already be

prepared to get the first five credit points from the elective subject examinations.

Com Tech currently offer a number of electives, with further courses to be added later in the year. Please refer to the Com Tech's National Training Schedule for dates of ECNE courses



The diagram illustrates the TCP/IP protocol stack, organized into layers from top to bottom:

- REDIR** (Redirection layer)
- CONN** (Connection layer) - This layer is split into two columns:
 - Left Column:** NWP (Network Process), BIND, NDS, LITE
 - Right Column:** FTP, CACHE, PBODI
- TRAN** (Transport layer)
- IPX** (Internet Protocol Extension)
- TCP** (Transmission Control Protocol)
- IPXODI** (Internet Protocol Extension over Data Interface)
- TCP** (Transmission Control Protocol)
- LINK SUPPORT LAYER** (Link Support Layer)

Vertical labels on the sides indicate the scope of the layers:

- CONN** (left side) covers the NWP, BIND, NDS, LITE, and FTP layers.
- VLM** (right side) covers the CACHE and PBODI layers.

Novell Updates NetWare Lite

Novell has announced a new version of its entry level peer-to-peer operating system, NetWare Lite 1.1. As well as bug fixes, the new version includes a number of new features such as look-ahead cache, new user and configuration utilities.


The new NetWare Lite Cache increases the performance of server disk activity by up to 600%. The cache utilises a look-ahead option that allows items to be cached before read requests have been made. It also

features delayed writes to allow multiple write operations together.

NetWare Lite Cache requires as little as 9K of resident memory and can utilise conventional extended or expanded memory. The cache can be as small as 16K or as large as 8Mb and is fully compatible with the XMS protocol, DOS network protocols, DesqView, Windows 3.x.

Users can now unload SERVER.EXE and CLIENT.EXE from memory allowing them to free

up RAM when they do not require NetWare Lite. Native NetWare commands such as NET WHOAMI, NET USERLIST have been added and NET ULIST and NET SLIST can be run without logging in.

Print job lists are now updated dynamically and users are notified when print jobs have been completed. CD-ROM support has also been added so clients can utilise a CD-ROM drive attached to a server 

NetWare Lite	NetWare v2.2
<i>NetWare Lite is a DOS-based network operating system for users who need to share basic network features and functions.</i>	<i>NetWare v2.2 supports OS/2, Macintosh, UNIX workstations, as well as DOS.</i>
<i>NetWare Lite has comparable performance to other peer-to-peer products. As users are added to peer-to-peer networks, however, performance degrades at a faster rate than it does with server-based products, such as NetWare v2.2 and v3.11.</i>	<i>NetWare v2.2's multiuser, multitasking architecture enables it to handle heavy database usage more efficiently than NetWare Lite and other peer-to-peer products.</i>
<i>NetWare Lite includes security features such as encrypted passwords, user account restrictions, resource access rights and audit trails. These security features may meet or exceed the needs of many businesses for protection against unauthorized access.</i>	<i>Some business such as law or financial offices may require more enhanced security. NetWare v2.2 provides flexible, multilevel security that starts at the file level and moves up through network directories, users, passwords and groups of users.</i>
<i>Although NetWare Lite does not include disk mirroring, disk duplexing or Hot Fix, it does offer features like auto-reconnect, distributed and synchronized user accounts, and a connection utility that verifies proper installation.</i>	<i>For network reliability, NetWare v2.2 includes disk mirroring, disk duplexing, Hot Fix and UPS monitoring that protect against equipment and power failures.</i>
<i>Unlike NetWare v2.2, NetWare Lite does not support internetworking and routing.</i>	<i>Users may need to purchase NetWare v2.2 or v3.11 if they are running vertical market applications that require server-based NetWare product.</i>

Comparing NetWare Lite and NetWare v2.2

NOVELL CEO RAY NOORDA TO ATTEND NETWORKERS' FORUM

August 18 - 19, Darling Harbour, Sydney

The Networkers' Forum hosted by Novell provides an invaluable opportunity for industry players and end users alike to examine the reality and promise of heterogeneous networks in the 90s.

The major draw card for attendees this year is the participation of Ray Noorda, President and CEO of Novell Inc., who will provide the keynote address.


A man of vision, Ray Noorda has been instrumental in Novell's phenomenal growth during the last nine years, driving the company to just under 70 per cent of the networking market while defining the role networks play in the world's corporations.

The Novell Networkers' Forum will bring together the leading vendor and end user experts in one venue to present their visions on the latest options available for the integration of networks. It will feature speakers from Univel, SynOptics, Proteon and Intel.

"The success of the first forum last year proved that an industry-wide approach to providing this vital information is paramount. Last year was the first time that the industry had presented such a united front to address the many and varied networking issues and we are pleased that such a wide range of vendors are again participating this year," said Mr Arthur Ehrlich, Managing Director of Novell Australia.

"It is only by working together that the industry can achieve what it has promised in the networking field, making heterogeneous networks a reality for modern business," he said.

1992 sees its incorporation with Network World, part of the Windows World exhibition hosted by IDG Publications. The show represents exhibitors involved in the networking and open systems environments.

Com Tech's stand at Network World will demonstrate the latest in product enhancements, including NetWare for Macintosh, NetWare for SAA, SynOptics and Lotus cc:Mail 



NETWORKERS'
f o r u m

Darling Harbour, Sydney. August 18-19, 1992.

Hosted by  NOVELL

PROFESSIONAL VOLUME OF NETWORK SUPPORT ENCYCLOPEDIA


The Professional Volume of Novell's Network Support Encyclopedia on CD-ROM is now available from all Com Tech offices.

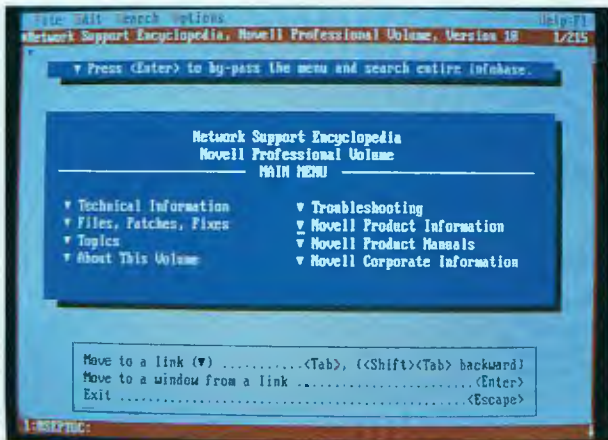
It features expanded Novell Technotes, product documentation, Novell press releases, NetWare Buyers Guide, NetWare Application Notes and downloadable NetWare patches, fixes, drivers and enhancements.

Updated 12 times a year, the Novell Professional Volume is a highly valuable reference tool for use in more complex Novell sites.

Working in conjunction with the core Network Support Encyclopedia (NSE), an electronic information base, it contains comprehensive network technical information needed to install a network or to maintain and troubleshoot an existing system.

Using the text-retrieval software bundled with the encyclopedia, users can search through custom menus, browse through manuals and technical bulletins, download files, patches and fixes, or do string searches using Boolean logic.

NSE collects technical information from Novell and third parties into a single source, giving users easy access to all the network information they need 



VAX connectivity simplified with Interconnections

Connectivity to the VAX environment has always been a difficult exercise. However the need for VAX/NetWare integration has been fuelled by the success of both the VAX environment and the PC networking arena.

Interconnections has produced a number of products that provide simple and seamless connectivity between the two very different environments.

TES NETWARE (TERMINAL EMULATION SERVICES)

TES NetWare is a terminal emulation solution that allows users to access VMS applications from their NetWare workstations. With TES, users no longer have to share terminals, or keep both a terminal and a PC on their desks.

Included with TES are VT220 and VT320 terminal emulations, file transfer, MS-DOS Kermit, other Int 14 terminal emulators such as Turbo Term can also be used. TES can manage up to nine sessions per PC at one time. The sessions can be connected to the same host or combination thereof.

WINTERM FOR TES

WinTerm for TES is an add-on product to TES NetWare that

provides a full featured VT100, VT220 and VT320 Terminal emulator for Microsoft Windows 3.x.

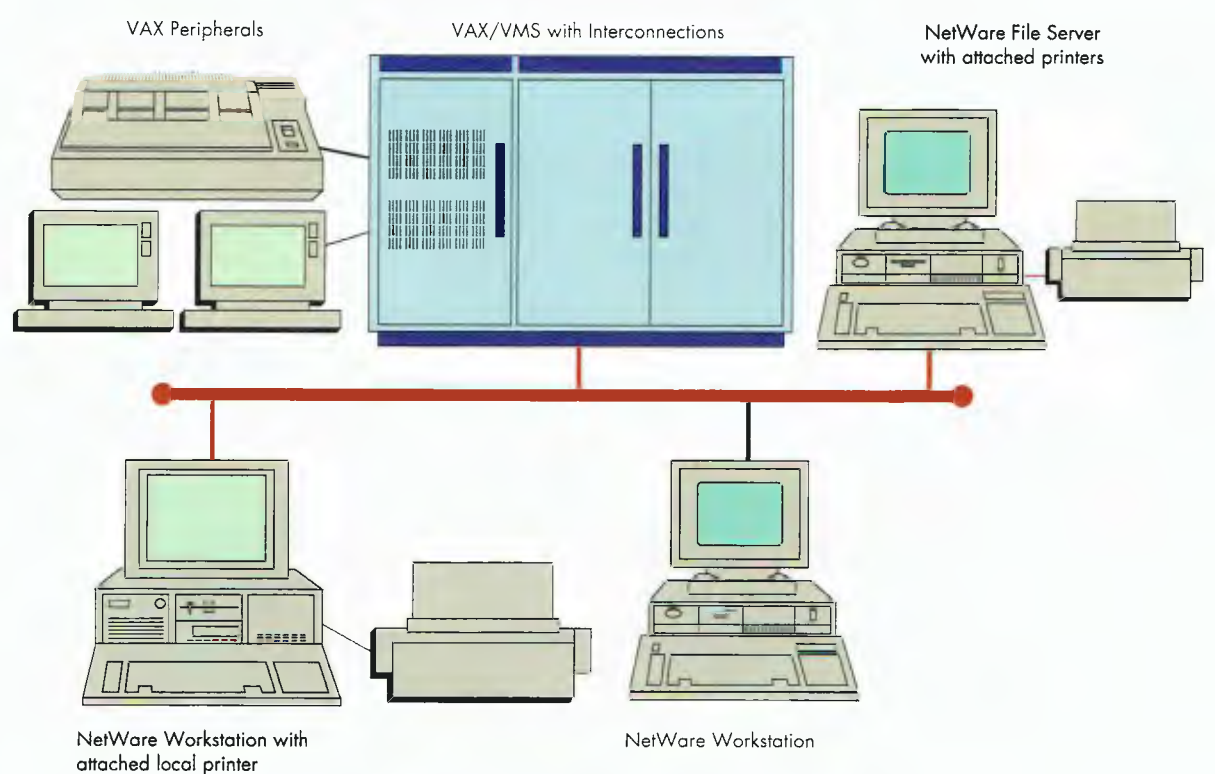
NPS (NETWARE PRINT SERVICES)

Any site that has VAXes and NetWare will understand that being able to print all jobs on the same printers, whether they originate from a NetWare node or a VAX terminal is a distinct advantage. Networked printers tend to be where people need them, on the desktop near a workstation. VAX printers are invariably away from users in a central location or hardwired into the furniture.

NPS is VAX resident software which allows VAX/VMS printer queues to spool jobs to NetWare printers. Any printer that can be assigned to a NetWare queue whether local, remote, line, laser or ink jet can be configured using NPS to service VMS jobs.

FILE SHARING SERVICES

File Sharing Services is a software product that enables a DEC VAX/VMS system to function as a file server, providing transparent integration of PC based LANs and VAX/VMS/DECnet based networks. DOS and OS/2 users can



share data, applications and printer services with VAX terminal users. Transparent access to VMS resources via the file and print services.

Automatic file translation is implemented to allow users to share files in their native operating systems. File Sharing Services

implements true NetWare file services on the VAX. The software operates as a single process on the VAX, with up to 254 DOS and OS/2 users accessing the server concurrently. The multiuser, multi threaded architecture handles multiple requests simultaneously.

File Sharing Services does not

compromise the VAX administrators control of the system. Since data is stored on the VAX using the RMS format, NetWare for VMS is subordinate to all VAX security and PC users have only as much access to files as the VAX system administrator grant them.

Xircom improves laptop connectivity through EPP support for new adapter software

Xircom, Inc., has introduced Software Release Version 2.0 for its Pocket Ethernet Adapter II product family which will enhance performance by up to 20 per cent over Version 1.02 and incorporates support for Enhanced Parallel Port (EPP) as a standard driver.

Developed by Xircom and Zenith Data Systems (ZDS), EPP technology significantly increases parallel port data throughput required by notebook users.

"Xircom is the first external LAN adapter company to support EPP technology as an integrated feature across its product range," said Sarah Dawson-Shepherd, Com Tech's Xircom Product Manager.

"The provision of EPP highlights the universal role of

parallel ports in networking notebook and laptop personal computers without the need for docking stations and reflects increased demand for connectivity among users," she said.

In comparison tests between personal computers with docking stations using internal network interface cards and EPP-capable notebook computers using Xircom's Pocket Ethernet Adapter II, Version 2.0 with EPP performed well in comparison to leading traditional Ethernet Adapters.

Version 2.0 is now available from Com Tech with all shipments of the Pocket Ethernet Adapter II.

"With Version 2.0, users can benefit from increased performance when connecting to a network

through the parallel port," said Ms Dawson-Shepherd.

"This release marks the expansion of the list of networking operating systems supported by Xircom with the introduction of support for OS/2 Release 1.3 or above to meet the needs of corporate users.

"Version 2.0, combined with the enhanced parallel port, removes the performance concerns sometimes attributed to parallel ports, producing a no compromise connectivity solution," Ms Dawson-Shepherd added.

EPP is implemented by Intel in the 25MHz 82360SL I/O companion chip for Intel386 SL CPU systems. The 386SL chip, and therefore EPP, has already been

incorporated into several laptops and notebook computers from several leading computer manufacturers such as ZDS, Compaq, Dell, NEC, NCR, Epson and Sharp.

EPP technology also facilitates the introduction of EPP-capable peripherals such as laser printers, external disk drives and tape back up units, capable of higher speeds through the parallel port when used with EPP-capable notebook and laptop computers.

Support for Xircom's Parallel Port Multiplexor (PPX) has been integrated into Version 2.0 allowing for automatic configuration for the PPX during installation which eliminates the need for a separate PPX driver.

Xircom has also announced Token Ring Software Release 3.10, known as SmartRing. SmartRing 3.10 supports drivers on any Xircom Token Ring Adapter, including Classics, and provides EPP support for all DOS drivers.

SmartRing 3.10 allows the setup program (TRSETUP) to be used as a device driver for both DOS and OS/2 applications to allow automatic media sensing in the External adapters. This methodology makes it possible to specify ring speed each boot time. Parallel port mode messages (non-bidirectional, bidirectional or enhanced) will now appear during initialisation of the Madge Smart drivers as well as Xircom's ODI driver.

Lotus ships major upgrades for cc:Mail

Lotus Development has announced major enhancements for its popular LAN-based electronic mail package, Lotus cc:Mail.

CC:MAIL FOR DOS 4.0
FEATURES TSR
Lotus cc:Mail for DOS Release 4.0 allows users to run cc:Mail as a

cc:Mail Administrators will also benefit from new administrative features of Version 4.0 which include a new version of ADMIN, improved reporting capabilities and support for up to 500,000 entries compared to 64,000 previous entries in the cc:Mail directory.

As a member of the cc:Mail

INTRODUCING CC:MAIL FOR MACINTOSH VERSION 2.0
As well as announcing the introduction of the new cc:Mail Platform Pack for DOS Version 4.0, Lotus has also announced a new platform pack for Macintosh.

Lotus cc:Mail for Macintosh Version 2.0 features Message Finder, a powerful message searching capability that allows users to quickly find information and easily share it with other cc:Mail users regardless of platform.

With Message Finder, users can search their in-box, folders, archives or bulletin boards by a variety of criteria, such as subject, text content, author, address, date, size, priority or message contents.

It identifies all instances of messages that meet the specified criteria, even if it resides in the body of the message text. Users can then read, file or forward the messages to others with one simple command.

cc:Mail for Macintosh also has significant user interface enhancements and closely emulates the native Macintosh user interface, making cc:Mail easy-to-use for those familiar with the Mac environment.

"This is the first e-mail product that uses the Macintosh to its greatest potential," said Ms Medway.

Windows can be configured to user-specified size, position and font style, and all operations can be performed using either the mouse or keyboard. The mouse can also be used to "drag-and-drop" files or addresses from one message to another.

"Macintosh users will feel right at home with cc:Mail for Macintosh Version 2.0," added

Medway. "This version offers significant new features and the best of both worlds - the ability to communicate across platforms and operating systems with other cc:Mail and electronic mail users, while at the same time exploiting the strengths of the Macintosh environment," she said.

Additional features include support for sound files, Apple's QuickTime video and colour highlighting in text messages.

Version 2.0 also offers cross-platform application association which allows users to instantly open attachment files created in MS-DOS or Windows from within cc:Mail if the corresponding Macintosh application is present.

Multiuser login, quick addressing, fast comment addition, Balloon Help and AppleEvents features are also available.

For administrators, cc:Mail for Macintosh Version 2.0 provides key mail management features. The cc:Mail for Macintosh server, or post office, resides on any AppleShare file server or any other file server. This includes NetWare, LAN Manager and Banyan VINES. It can be administered from a Macintosh anywhere in the network.

NEW LOOK FOR CC:MAIL FOR WINDOWS 1.11
Lotus has also made a series of enhancements to the user interface for cc:Mail for Windows 1.11.

It now features log-in dialogue and reply, large directory support. It also offers editor-overstrike and insert toggling, fax printing and rotating, text filters and viewers and lex printing.



terminate and stay resident (TSR) application, enabling users to hot-key between mail and other applications.

Version 4.0 incorporates an in-built spell-checker, licensed from Houghton Mifflin Company, which allows users to review documents for errors in text using a 190,000-word dictionary.

It also features draft and trash folders, Fax View, application launching, full-text search by keyword, configurable text editor keys, PostScript printer support and an improved user interface.

family, Version 4.0 allows users to exchange messages with other cc:Mail users on the Windows, Macintosh, OS/2 and MS-DOS platforms. This provides transparent information exchange within an enterprise-wide multi-platform architecture.

"The significant enduser and administrative enhancements in cc:Mail's MS-DOS Platform Pack Version 4.0 clearly demonstrate Lotus' commitment to cc:Mail and its users," said Kim Medway, Lotus' marketing manager for Australia and New Zealand.

SPECIAL OFFER

Purchase a Xircom Pocket Ethernet Adapter now
and receive a free copy of Xtree Virus
Protection software

TRAINING TRAINING TRAINING TRAINING

Lotus cc: Mail August Training Schedule



Lotus cc: Mail System Manager - 1 day			
MONTH	DATES	VENUE	RRP \$
Aug	21	Syd	350.00

INTEL SATISFAXTION CARD GAINS AUSTEL APPROVAL

Intel's SatisFAXtion card has become one of the first network fax cards to pass Austel's stringent testing criteria to gain approval number A92/2F/0265 on 3rd July. Com Tech will now be able sell the product through its reseller.

The SatisFAXtion card is an add-in board for

ISA and MCA-based machines that provides fax, modem and scanning capabilities which, when combined with the NetSatisFAXtion Software, provides a complete network fax solution.

The card can send and receive faxes to/from Group III fax machines or other Intel Satisfaction cards at 9600bps and supports HP Laser Jet II emulation and PCX graphics files. Postscript is not yet available. Users can create phone books for frequently used numbers and can also specify when the fax should be sent allowing them to take advantage of cheaper phone rates for non urgent faxes.

Administrators can manage fax queues from anywhere on the network, including the ability to monitor fax board and server statistics and manage queue jobs. The SatisFAXtion card is also compatible with Lotus' cc:fax product.

SynOptics brings switching technology to the hub with LattisSwitch System 3000

The shift to distributed computing and the increasing use of applications requiring greater processing power in desktop computers and servers has created a demand for local area networks (LANs) that provide more flexibility and greater bandwidth or data throughput. Many new technologies, such as ATM, are currently being developed to alleviate throughput problems on network backbones.

LOOKING TO THE FUTURE OF ETHERNET

However, practicality and cost must still be addressed before these new technologies can be effectively deployed in the network wiring closet and in the workgroup. Indeed, the existing investment in Ethernet - the most widely used access method for workgroup configurations - is far too large simply discard in favour of promising, but not yet proven, new technology.

Over the past few years, several methods have been employed to extend the life of Ethernet through creative LAN design. The result, widely deployed today, is a highly segmented network with interconnected workgroup hubs utilising traditional bridging and routing devices as the segmentation technology. However, throughput demand accelerates every year.

The requirement for more and more bandwidth has seemingly exhausted the Ethernet's capabilities and has forced an ultimatum upon the user: live with the current bandwidth constraints or abandon the Ethernet investment for another technology that will satisfy growing bandwidth needs.

INTRODUCING THE LATTISWITCH SYSTEM 3000

In response, SynOptics has developed a solution that addresses these issues. The result is a new capability that increases Ethernet workgroup flexibility in terms of connectivity, internetworking options, modularity and network management.

The solution, called the LattisSwitch System 3000, features multiple Ethernet segments within

a single, modular, manageable intelligent hub, along with a new internetworking technology that removes the bandwidth constraints posed by traditional segmented Ethernet network designs.

"We believe that SynOptics' new implementation of multi-segment Ethernet is the most flexible and cost-effective solution available today," said Dave Jacobson, SynOptics Product Manager, Com Tech Communications.

"This new extension of the SynOptics System 3000 offers more throughput and flexibility for Ethernet networks,"

"These benefits are easily provided because of the scalable architecture inherent in the System 3000 intelligent hub," he added.

According to Dave Jacobson, the new Ethernet Switching Engine (ESE), developed with Kalpana, Inc., marks the first time that this technology will be available in an intelligent hub. Ethernet switching offers a means to interconnect multiple Ethernet segments with significant performance and cost advantages over conventional bridging.

SynOptics' LattisSwitch System 3000 is a multi-segment Ethernet architecture that provides high-performance Ethernet switching, investment protection, configuration flexibility and competitive pricing per port.

The cornerstone of the LattisSwitch System 3000 is the intelligent hub, an extension of SynOptics' existing Model 3000 Series hub. The LattisSwitch supports up to five fully managed Ethernet networks in a single chassis, with high-performance Ethernet switching providing connectivity between the segments. The offering includes a new backplane for current System 3000 intelligent hubs, as well as new network management, host and Ethernet switching modules.

"This new extension of the SynOptics System 3000 offers the opportunity to provide more throughput and flexibility to users on existing Ethernet networks," explained Richard Leshner, Manager Network Solutions from Andersen Consulting Australia.

"This is very significant, given the investment in Ethernet equipment. The combination of SynOptics intelligent hubs and the Ethernet switching technology will provide an excellent way to build

enterprise wide LAN infrastructures."

IMPLEMENTING MULTI-SEGMENT ETHERNET

SynOptics has implemented multi-segment Ethernet by modifying the existing Ethernet "A" channel on the existing System 3000 backplane, enabling it to be divided into as many as four Ethernet segments. All existing System 3000 Ethernet modules can plug into any segment on this channel.

A fifth segment is implemented via a second Ethernet channel on the backplane, channel "B". The new SynOptics Ethernet modules take advantage of this second channel.

The new modules include a 24-port high-density 10BASE-T host module, two new Ethernet network management modules with connectors for both A and B channels, and a new Ethernet Switching Engine™ to be jointly developed with Kalpana, Inc.

The new high-density 10BASE-T module will enable customers to build networks with up to 264 ports in one LattisSwitch System 3000. The new module can be logically configured on the "A" or the "B" channel from a network management station.

The new network management modules, offering fibre

optic or AUI connector options, are capable of managing ports on either channel. Both versions provide all the functionality of their existing single-channel counter-parts, and existing network management modules can still be used on the "A" channel.

EXTENDING NETWORK MANAGEMENT CAPABILITIES

With the new LattisSwitch System 3000, customers can choose to use one network management module per hub for administrative capabilities such as Expanded View, LED status and port control for all modules.

By installing separate network management modules in each segment, customers can implement more extensive management capabilities such as detailed statistics, support for the Autopoly™ dynamic mapping feature, node security and thresholds.

THE ADVANTAGES OF ETHERNET PACKET SWITCHING

Ethernet packet switching offers three distinct advantages over unsegmented LANs and those using conventional bus-based bridges or routers.

ETHERNET THROUGHPUT EXTENSION

By segmenting the 10 Mb/s Ethernet into multiple channels, the switch allows multiple simultaneous data exchanges and multiplies the throughput on the Ethernet LAN without any end station hardware or software changes. For example, a hub with four switches can deliver up to 170 Mb/s total Ethernet bandwidth - 17 times that of a single Ethernet.

HIGH PERFORMANCE AND LOW LATENCY

The parallel architecture of the switch allows it to deliver full line-speed forwarding and filtering across multiple ports without imposing latency delays on switched traffic. Unlike bridges and routers based on store and forward technology, which may delay maximum sized Ethernet packets by 1,200 microseconds or more, the switch passes each packet with as little as a 40

microsecond delay. Since there is no contention for bus and processor resources like a conventional device, the packet passes right through the switch on its path to the destination.

LOWEST COST IMPLEMENTATION AND OPERATION

By implementing the essential function of the switch directly in hardware, Ethernet switch devices offer a significant reduction in the per-port cost for multiport devices. Unlike conventional internetworking devices, which utilise a complex bus structure and general purpose processors, the switch hardware is dedicated to delivering high-speed parallel circuits. And since the switch requires little configuration or administration, operating costs are extremely low once the switch is installed in the hub.

APPLYING THE TECHNOLOGY

"Ethernet switches offer cost, performance and scalability advantages when designing high-speed Ethernet systems," said Mr Dave Jacobson.

"They do not replace conventional bridges and routers, but rather are used to complement these devices in a well-designed LAN," he said.

Particularly when designers are concerned with maximising Ethernet performance while preserving an investment in Ethernet wiring, hubs and interface cards. Switching technology as featured in SynOptics' LattisSwitch System 3000 provides an easy answer.

The most appropriate applications for switches include:

- In the wiring centre, linking multiple segments in an Ethernet hub;
- In the wiring centre, providing dedicated Ethernet channels for high performance power users and servers; and
- In the network centre for handling local data flows.

For distributing data across a distributed local area network (LAN), FDDI and bridged or routed connections will still dominate the application ☐

New entry level management software

SynOptics has announced a new low-cost, easy-to-use management system for Ethernet LANs and a new price for its midrange LattisNet® Manager for DOS management application.

Called Lattis EZ-View™, it is designed to give small businesses and branch offices of larger organisations a low-cost means to use their SynOptics intelligent hubs to perform basic network management functions, such as port partitioning and performance monitoring.

The Lattis EZ-View software can be run from any workstation that uses Microsoft Windows 3.1 on Ethernet networks, including those running on Novell NetWare 3.11 network operating system. As with all of SynOptics' network management software, Lattis EZ-View supports industry-standard Simple Network Management Protocol (SNMP) conventions. It is priced at \$1,225 per licence.

"Intelligent hubs are now the accepted means of building local area networks - even for small businesses

and departmental LANs," explained Steve Wood, SynOptics' General Manager for Australia and New Zealand.

"With its pricing, ease-of-use and SNMP support, Lattis EZ-View gives added incentive for customers to try network management. As these customers' networks grow, we provide a clear upgrade path to meet their expanding network management needs."

The LattisNet Manager for DOS price has been reduced to \$6,100 and the company's LattisNet Basic Network Management for DOS product has been discontinued, to provide a clearer upgrade path in the product line.

AN EASY TO INSTALL MANAGEMENT SOLUTION FOR NOVELL NETWORKS

The Lattis EZ-View software is intended for organisations that have up to 15 intelligent hubs and no dedicated PC-based management station. The product is delivered on

four diskettes and can be installed in just a few minutes.

Lattis EZ-View then appears as part of the Windows menu bar and can be initiated with a simple double click of the program icon - a marked contrast to most network management systems, even those specifically targeted for smaller Novell networks.

In Novell environments, Lattis EZ-View requires NetWare Version 3.11, which supports the TCP/IP networking protocol necessary to run SNMP.

"There are a lot of users who have simple management needs, such as the ability to turn ports on and off, check the status of the intelligent hub or monitor traffic and utilisation. Lattis EZ-View is ideally suited for these small- to medium-sized networks commonly found in Novell environments."

LATTIS EZ VIEW OFFERS EXPANDED VIEW CAPABILITY

Lattis EZ-View offers the Expanded

View™ capability found on SynOptics' more sophisticated management systems. All intelligent hubs being managed on the network are listed in a window called the "concentrator list box".

The status of each hub is indicated by the background colour of the list box entry. The user simply double clicks on the concentrator and a graphical reproduction of the hub and LED status is displayed on screen and various operations can be performed.

As an organisation grows, the upgrade from Lattis EZ-View application to SynOptics' full-featured LattisNet Manager for DOS consists of installing additional software.

Lattis EZ-View, LattisNet Manager for DOS and LattisNet Manager for UNIX applications all use the Expanded View feature, thus preserving the users' training and knowledge of the application as they expand their management capabilities ☐



SYNOPTICS APPOINTS COM TECH AS AUTHORISED TRAINING CENTRE

SynOptics Communications Australia has appointed Com Tech as a SynOptics Authorised Training Centre (SATC) for its comprehensive range of network management products.

Com Tech is one of only two such SATCs in the South Pacific and the only one in Australia.

Mr Steve Wood, SynOptics' Area Sales Manager Australia/New Zealand, said Com Tech's appointment as a SATC means resellers and end-users will now have access to quality training on SynOptics products.

"Networking decisions have a significant impact on a company's bottom line and we are committed to helping our customers maximise their investments by providing the best possible training," said Mr Wood.

"Com Tech has an excellent reputation in the training arena and by qualifying as a SATC will further raise the level of support for SynOptics in Australia," he said.

Mr David Shein, Com Tech's Managing Director, said training is an integral part of Com Tech's business.

"Our appointment as a SATC means we can continue to grow in this area, by offering the highest level of support for the products we sell," said Mr Shein.

According to Mr Gary Chin, Com Tech's National Training Manager, the appointment of the company as a SATC means they can better meet the needs of their customers.

"Because of the broad marketplace acceptance of SynOptics products, there is great demand from our resellers and end-users for SynOptics training," he said.

SynOptics' training courses currently being held by Com Tech in Melbourne and Sydney include:

- Advanced Network Management Systems Certification
- Ethernet Integration Certification
- Token Ring Integration Certification

"At Com Tech we try to differentiate our training by offering value-added, hands-on sessions. For example, we create real situations and simulate problems that the trainees must solve," Mr Chin said.

"The initial response to our training schedule has been overwhelming and we expect high attendance rates at our upcoming SynOptics' courses," he said.

Prior to the appointment of an SATC, SynOptics implement a stringent and thorough training course and examination at their headquarters in Santa Clara, California, to ensure the company's high standards are maintained through to the end-user.

Earlier this year, two Com Tech training staff travelled to SynOptics' headquarters to undertake the two-week intensive training course on all aspects of SynOptics products, and were required to sit and pass an examination with a score of at least 80 per cent.

Further to this, Com Tech staff were required to co-teach in Australia with SynOptics representatives to ensure that their knowledge and techniques were of the highest standard ☐

TRAINING TRAINING TRAINING TRAINING

SYNOPTICS August-September Training Schedule



*Ethernet Connectivity CERTIFICATION - 2 days			
MONTH	DATES	VENUE	RRP \$
Aug	24-25	Melb	700.00
Sept	28-29	Syd	700.00

*LattisNet Advanced Network Management 4.0 CERTIFICATION - 3 days			
MONTH	DATES	VENUE	RRP \$
Aug	26-28	Melb	1050.00
Sept	30-2 Oct	Syd	1050.00

SynOptics Courses available on Request	
COURSE NAME/COURSE CODE	PRICE
Token Ring Connectivity Certification	3,500.00

* NEW COURSES

The logo for the ROUTERXchange 7000, featuring the text "ROUTERXchange" in a sans-serif font above a large, stylized "7000" that incorporates a checkered pattern.

THE NEW STANDARD FOR NETWORK ROUTING.



SEND IN THE CLONES.



The industry's leader in network protocol technology now brings you the industry's most advanced multiprotocol router. The ROUTERXchange 7000™ from Retix.

With its exclusive Parallel Routing Architecture™, the ROUTERXchange delivers maximum performance and network uptime.

Featuring the advanced functionality you need for today and tomorrow: ▲ A modular, multi-processor RISC architecture ▲ Any combination of up to 12 LAN and WAN interfaces ▲ Ethernet, Token Ring, and FDDI connectivity

▲ PPP/HDLC link protocols ▲ ATM ▲ Frame relay and X.25 ▲ Data compression ▲ On-line system reconfiguration/redundancy ▲ Spanning Tree Protocol ▲ SRT for Token Ring ▲ SNMP management ▲ And much more.

Advanced features. Dramatic performance. The best diagnostics in the industry. Plus the versatility to grow with your network. It all adds up to a new standard in network routing – the ROUTERXchange 7000.

Beware of imitations.

For more information, call Com Tech today. (02) 317 3088 or (008) 263 954



Retix®

The **OPEN** Networking Company™

Proteon introduces entry level DNX 300 Bridging/Router

Proteon is extending its range of multi protocol bridging routers with the introduction of a new family of entry level routers which are designed to complement the existing mid-range CNX 500 high speed backbone bridging router and the expandable p4100+ platform for mixed LAN environments.

The launch of the DNX 300 Bridging/Router addresses the fast growth being experienced in the low-end router market as more "departmental" LANs are established and remote LANs are connected to the home office.

Typically, users in these environments have a well-defined need for equipment that will solve their network connectivity problems; support accepted industry standards; provide a cost-effective solution;

make their networks easy to use and maintain; and protect their equipment and network investments.

The DNX 300 meets all these needs in a highly reliable package. Built around a 25MHz 80386 processor, it offers speeds of 5,000 pps. Extensive platform migration capabilities provided through flexible LAN interfaces, Flash EPROM and flexible WAN interfaces enable users to migrate easily between Shielded Twisted Pair (STP) to Unshielded Twisted Pair (UTP) media and into a WAN environment, as well as making upgrades and enhancements quick and easy.

LAN interfaces include 4/16 Token Ring and Ethernet/IEEE 802.3, while WAN interfaces include Dual Port, X.25/Frame Relay, PPP and OSPF. All major protocols

including Novell IPX, TCP/IP, DECnet IV & V/OSI, OSI, AppleTalk 1 and 2, Apollo DOMAIN, XNS, Banyan VINES, Transparent Bridging, Source Routing Bridging, SDLC/HDLC Relay via TCP/IP and SRB Tunnel via TCP/IP are supported.

The inclusion of Frame Relay, standards-based OSPF and quick installation features enable users to contain costs in the WAN environment and lower installation and training costs.

Investment is protected long term by the inclusion of a transportable router for intelligent hub integration, and by the use of advanced SMT manufacturing techniques which ensures high reliability for a longer life and lower maintenance costs.

Com Tech attends DECUS World Congress Centre, Melbourne August 24-28

Com Tech has joined forces with SynOptics and Retix this year to demonstrate connectivity solutions within the DEC environment.

"As the only show dedicated to the DEC environment in Australia, it promises to be an extremely worthwhile event. This is the first time Com Tech has participated in the show and we look forward to raising our profile in this arena," said Nathan Cher, Com Tech's Technical Director.

Com Tech will display a suite of NetWare-VAX software

connectivity products from the Interconnections range of products, including file sharing devices, terminal emulation and NFS.

SynOptics will feature its intelligent hubs comprising Ethernet, Token Ring and FDDI as well as a series of managed bridges and routers and other internetworking products.

Retix will demonstrate its X.400 messaging technology.

"As users in the DEC marketplace move from terminals to intelligent workstations, a major

priority is the integration of DEC VAX with these new systems," said Mr Cher.

"A Novell network is an ideal way for users to integrate VAXes, and coupled with SynOptics intelligent hubs and network management software, and Retix managed bridges and routers, they are able to better manage and control their networks," he said.

DECUS, also known as the On\$DECK exhibition, will be held from August 24-28 at the World Congress Centre in Melbourne.

NEW HIGH END ROUTER FAMILY FROM RETIX

Retix has released its new multi-processor, RISC-based internetworking solution aimed at the high-end router marketplace.

The ROUTERXchange 7000 is a high performance, 12 port, multiprotocol router, designed to meet expanding needs of network designers to build large, geographically dispersed networks.

Based around the Intel i960 RISC processor, the RX7000 provides multimedia connectivity between Ethernet, Token Ring and FDDI networks. The product allows both bridging and routing of OSI, TCP/IP, DECnet and IPX and supports link level protocols such as PPP and HDLC. Routing technologies such as TCP/IP's OSPF and OSI's IS-IS are also supported.

The RX7000 is the first router on the market to support Asynchronous Transfer Mode (ATM) in addition to the established X.25 link and upcoming Frame Relay wide area networking (WAN) technologies.

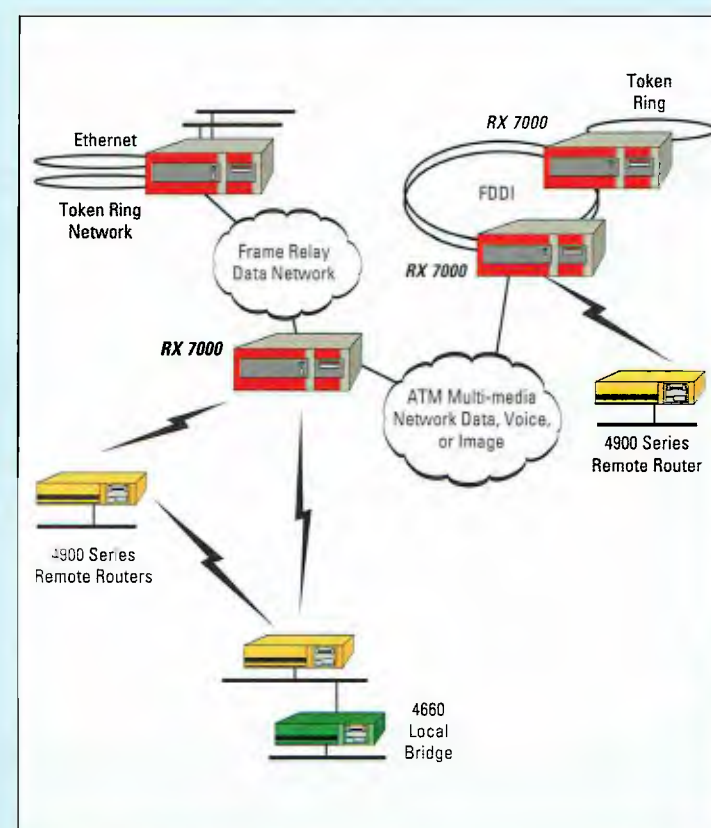
As the latest addition to the Retix family of Bridge/Routers, it also incorporates features such as data compression, selective filtering and Spanning Tree Protocol support.

"The RX7000 promises exceptional performance thanks to its exclusive second generation Parallel Routing Architecture™ which features up to five Intel i960 RISC processors".

"Combined with the flexibility and configurability of the router, we believe that the RX7000 is the most sophisticated high-end router on the market today," said Steve Penn, Com Tech's Retix Product Manager.

"The initial release of the product will offer impressive bridge and router packet forwarding capabilities of 30,000 pps with future release supporting up to 400,000 pps which we are confident will bring immediate benefits to our customers," he said.

The first model RX7000 will begin shipping this month and will support Ethernet and WAN connectivity with routing capabilities for IP, IPX and DECnet. Further modules will be available in October for Token Ring FDDI, ATM and Frame Relay.



LAN/WAN Applications Flexibility

OSPF: next generation routing comes to TCP/IP networks

Open Shortest Path First (OSPF) is a new generation of dynamic routing protocols that promises to be the successor to the Routing Information Protocol (RIP) currently popular in TCP/IP environments.

RIP is the only dynamic routing protocol in the TCP/IP arena to date that supports interoperability among routers from different vendors. As a next generation protocol, OSPF has been designed to facilitate interoperability among routers in large, multi-vendor TCP/IP internetworks and to provide services not available from RIP.

The OSPF protocol was

allow a network manager to define multiple subnetworks through more efficient use of the IP address space. Another OSPF feature, type-of-service routing, lets network managers select the communication line(s) best suited to an application.

As an internetwork grows, its topology becomes increasingly complex. A dynamic routing protocol is essential in large internetworks to enable communication between diverse network hosts and the devices (such as routers and bridges) that connect them.

Operating at the network layer (layer 3) of the Open Systems

provide a better understanding of its functionality and limitations.

RIP'S LIMITATIONS

RIP is significant as the first standard TCP/IP protocol to ensure interoperability between different vendors' routers. Originally designed for use in the Xerox Networking Services (XNS) protocol suite, the RIP algorithm was modified for TCP/IP and incorporated into the Berkeley Software Distribution (BSD) UNIX operating system software in the 1980s.

The popularity of UNIX workstations led to extensive

addition, the slowness of the update procedures contribute to the formation of routing loops in RIP-managed networks.

Hop count refers to the number of router-to-router journeys or hops that a message must take to reach the destined network. As depicted in Figure 1, the hosts on network A are five hops away from network E, four hops away from network D, three hops away from network C, and so on.

Similarly, hosts on network C are three hops away from networks A and E, and two hops away from networks B and D. Thus, the hop count is simply the sum of the

In addition, hop count metrics make no provision for the line speed or delay of any network link. Consider the example in Figure 2 of a simple mesh network with assorted network types and speeds. When transmitted from host X to host Y, packets will always be routed across the 9600-bit-per-second (bit/sec) serial link because it has the shortest hop count; this route will be used regardless of the greater bandwidth offered by the 1.544 Mbit/sec T1 links.

One serious by-product of a distance vector-based protocol such as RIP is slow convergence, which results in problems in large internetworks. Convergence is an internetwork state in which all routers share a common understanding of the routing topology. This convergence is disturbed whenever a link fails.

After a link is lost, time elapses while new routing information propagates throughout the autonomous system. During this propagation period which can last tens of seconds, routing inconsistencies sometimes result in the formation of routing loops.

Routing loops occur when inconsistent routing tables cause a router to forward a packet to a second router, which either sends the packet back to the originator or forwards it on to a third.

The third router in turn, may return the packet to the first router, causing the packet to circulate continuously within the router group until the packet times out and is purged from the network, or the routing loop is corrected.

Another update problem associated with RIP stems from the requirement that all routers must frequently broadcast routing tables to their neighbours. In sizeable internetworks, these tables can become so large that routing updates contain multiple back-to-back packets.

RIP specifies a 512 byte maximum size packet which allows for information about only 24 destination network/hop count pairs to be exchanged in a single packet. This means that 11 back-to-back 512 byte RIP packets are required to broadcast a routing table with 250 entries. It can take almost a full second to transmit 11

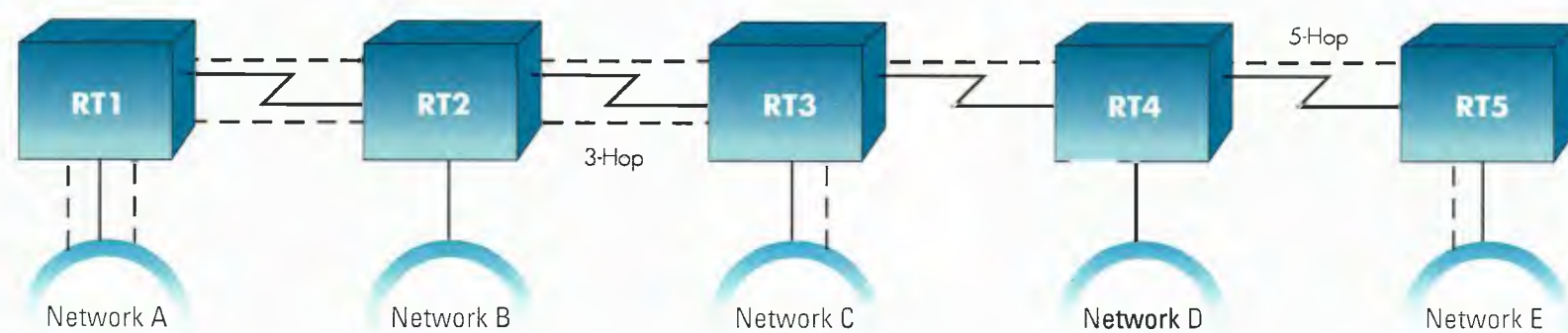


FIGURE 1. Hop count is the sum of the routers through which a message must pass to reach its destination

developed by the OSPF Working Group of the Internet Engineering Task Force (IETF), an adjunct of the Internet Activities Board. The objective of the OSPF Working Group, formed in the spring of 1988, was to tailor an Interior Gateway Protocol (IGP) to the specific needs of the TCP/IP community. The culmination of its work is documentation of the OSPF protocol specification in the TCP/IP Internet's RFC 1131.

One of OSPF's key features is least-cost routing, which allows network managers to choose an optimal routing path based on cost or delay factors. Another key capability is multi-path routing, which allows for load balancing and efficient bandwidth utilisation.

OSPF has several network management features, including area routing and support for variable length subnet masks. With area routing, a network manager can restrict the traffic generated by a router to a specific area, thus reducing routing traffic across the internetwork.

Variable-length subnet masks

Interconnection (OSI) reference model, routers use dynamic routing protocols to exchange information about the internetwork and expedite the internetwork's recovery from failures. In TCP/IP environments, a collection of routers and networks form a routing domain called an autonomous system, which is treated as one administrative entity.

Routers in an autonomous system swap information about the status of known data paths via a dynamic routing protocol. If a link goes out of service, the system's routers notify each other about the outage so they can select a different path.

Until the development of OSPF, most dynamic routing protocols for TCP/IP were based on the Bellman-Ford distance vector algorithm. Bellman-Ford-based protocols are well suited for use in small internetworks. However, as an internetwork grows, Bellman-Ford-based protocols display limitations due to their simplistic update procedure. RIP is a Bellman-Ford-based protocol. A close examination of RIP will

distribution of RIP. As a result, RIP became the most widely used IGP, which is a protocol that determines whether a network can be reached and conveys routing information within an autonomous system.

As a Bellman-Ford distance vector algorithm, RIP has certain restrictions that prove troublesome in large internetworks. These restrictions relate to the maximum number of hop counts, required bandwidth, and efficiency of update methods.

For instance, RIP supports a maximum of 16 hops which limits the ultimate size of an internetwork to 16 consecutively connected networks. RIP's routing updates consist of frequent broadcasts of the entire routing table; unfortunately, these broadcasts can consume considerable network bandwidth.

RIP sometimes fails to select the most efficient and economical media for a given transmission because it takes the minimum hop path, even if the data lines representing the minimum-hop path are less appropriate to the application than other lines. In

routers through which a message would pass inside an autonomous system.

In large internetworks, the use of hop count as a routing metric is problematic for several reasons. First, the RIP metric has a limit of 16 hops. Since a destination network that requires more than 16 consecutive hops can be classified as "unreachable", RIP cannot provide adequately for information delivery in a large environment.

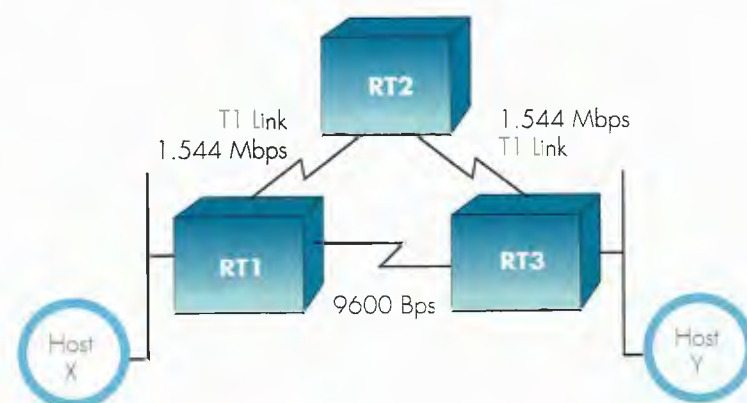


FIGURE 2. If hop count is used as the primary routing metric, then packets will always be routed across the 9600-bit/sec serial link because it has the shortest hop count, even though the 1.544-Mbit/sec T1 links offer greater bandwidth.

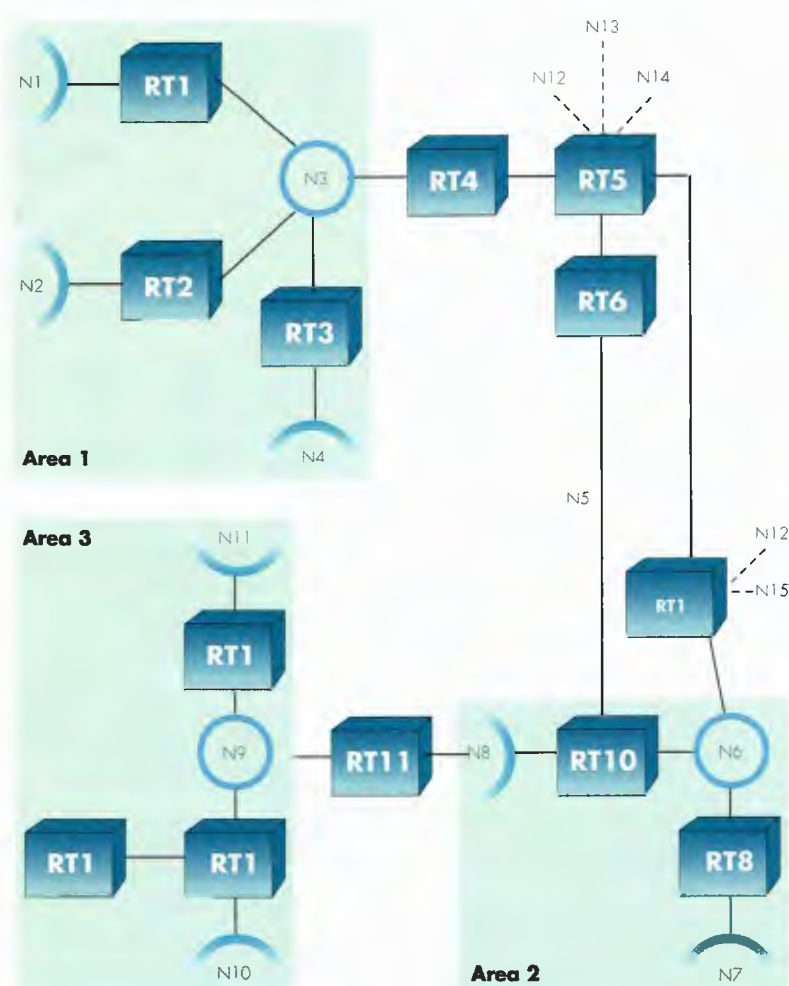


FIGURE 3. With OSPF, update traffic is minimized by the use of area border routers. Here, router 4 acts as area border router to area 1; router 11 is an area border router for area 3; and router 7 is an area border router for area 2.

back-to-back RIP packets over a 56 Kbit/sec serial link. As a result, user data traffic can be severely impacted.

OSPF remedies the problems associated with RIP and at the same time addresses network managers' needs for tools for load-balancing and router administration. OSPF also provides many new features, including least-cost routing, efficient routing updates, area routing, type-of-service routing, multipath routing, routing authentication and external source evaluation.

Least-cost routing offers a user-configurable metric, which enables network managers to define network size and configuration parameters with an eye for routing economy.

OSPF update procedures reduce network traffic and conserve bandwidth. The routing area capability allows a network manager to subdivide an internetwork into different areas in order to limit networkwide traffic. Type-of-service routing permits the designation of eight classes of service (based on bandwidth, delay, and reliability) and the selection of the most suitable medium for each transmission.

Routing authentication identifies the source where data originates, while external source evaluation ranks the relative trustworthiness of data sources beyond the internetwork. Let's examine each feature in turn.

OSPF'S LEAST-COST ROUTING

OSPF's user-configurable, 16-bit routing metric provides the ability to design least-cost routing. OSPF's

routing updates contain a metric for each interface on a router. The ability to define this routing metric enables network administrators to distribute traffic efficiently over public and private data networks by sending transmissions over the least-cost route (cost is defined in terms of load, delay, and bandwidth as well as actual dollar cost).

To take advantage of this feature, a network manager simply sets the OSPF metric to reflect those factors he or she considers most significant load (volume of traffic), delay, bandwidth, or dollar cost. Once the metric has been defined, the router compares the relative load and cost of possible paths, and automatically selects the most cost-effective path.

OSPF's routing metric permits the inclusion of additional criteria that pertains to type of service. With these capabilities, the network manager is better equipped to resolve the continual dilemma of balancing cost against capacity.

This type of routing flexibility is key to optimal utilisation of local area network and wide area network facilities. When planning routing, network managers must weigh the fixed installation and maintenance costs associated with LANs against the ongoing line usage costs associated with WAN links.

For example, it may be preferable to route traffic over interconnected LANs and to avoid using X.25 links (the interfaces on the various routers need to be prioritised to reflect this).

Before selecting WAN routes, you should calculate the cost of a dedicated, high capacity circuit (T1 lines, for example, can run

thousands of dollars per month). Organisations contemplating the use of public packet-switching networks must also compute potential access and usage charges. These can exceed a thousand dollars per month, depending on the volume of traffic.

Today, increasingly popular private T1 and X.25 networks offer network administrators the opportunity to create LAN-to-WAN networks with voice and data transmission capabilities. In private long-haul networks, the relative economy of alternate paths must be compared prior to route allocation.

ROUTING UPDATES CONSERVE BANDWIDTH, AVOID LOOPS

OSPF's update procedures were designed to reduce network traffic and conserve bandwidth. For reasons of efficiency, OSPF's data presentation and routing update mechanisms differ from those of a distance-vector routing protocol.

OSPF requires routing table updates only when the status of a link changes. Since updates circulate within a confined area of the internetwork, update procedures conserve bandwidth. Moreover, a distributed database and rapid updates make OSPF resistant to routing loops.

Instead of broadcasting an entire routing table, an OSPF router transmits a small packet describing the health of its network links or link state. This packet, called a router links advertisement, contains pertinent information about each router interface including the operating state and cost metric.

In broadcast networks (such as Ethernets), several routers generally connect to the same physical network. In these multi-router environments, OSPF elects one router to act as a designated router, which performs broadcasts for every node in that network. To reduce overall traffic, only designated routers can send a special packet called a network links advertisement, which reports the status of all the network's routers.

Instead of broadcasting entire routing tables to neighbouring routers, as RIP does, OSPF economically floods the small router links advertisement and the network links advertisement packets throughout the routing area. The OSPF flooding technique provides a reliable and robust method that ensures packet delivery.

To confirm delivery, OSPF requires any router that receives a packet to send an acknowledgment to the router it received the packet from. In addition, OSPF packets utilise the IP multi-cast standard (where a single packet can be addressed to multiple destinations) to further reduce routing traffic overhead.

Using these advertisements, the routers construct a uniform

database so that each router in an area contains an exact copy of the same database. From this distributed database, routers individually calculate routing tables with entries that indicate the least-cost path to each destination.

By maintaining a distributed database, OSPF avoids the bandwidth depleting broadcasts associated with RIP. Since OSPF reacts to changes in link state, the protocol requires a routing update only when a particular interface or line fails or recovers. As a result, OSPF produces substantially less routing overhead than many other routing protocols.

In addition, OSPF's distributed database circumvents RIP's "slow convergence" problems. After a router detects a topology change, the flooding technique rapidly updates each router's database so that new routing tables can be promptly calculated for all routers in the area. This rapid convergence makes OSPF resistant to the formation of routing loops.

AREA ROUTING DECREASES TRAFFIC, INCREASES CONTROL

OSPF's area routing capability is a powerful administrative mechanism that allows a network manager to partition an internetwork into smaller sub-domains. Dividing an internetwork into smaller routing areas reduces traffic throughout the autonomous system and offers security advantages. Internetworks often cross organisational boundaries, linking universities and corporate entities, for example. With OSPF, update traffic generated by the

router 7 is an area border router for area 2.

Two copies of the OSPF protocol run in router 4. The first operates within area 1, accepting flooded advertisements from other area 1 routers. At the same time, a second copy of OSPF operates over the link that connects area 1 to the backbone. Router 4 does not propagate the flooded advertisements associated with area 1 across the backbone. Instead, router 4 sends summary link advertisements over the backbone that area 1 can learn about the overall network reachability without directly participating in another area's routing advertisements. This administrative practice protects areas from receiving routing information from other areas, while reducing overall traffic on the backbone.

In addition to reducing routing traffic, areas allow for the development of a hierarchy of routing information. Since the area feature protects each area from updates originated in other areas, it also permits construction of a trust model, which indicates the trustworthiness of information sources.

Finally, areas allow the physical topology of a sub-domain to be hidden from the rest of the network. This 'information hiding' technique is the primary method for reducing routing traffic across the backbone.

It is also important from a network security standpoint, since information hiding prohibits other sub-domains and external internetworks from

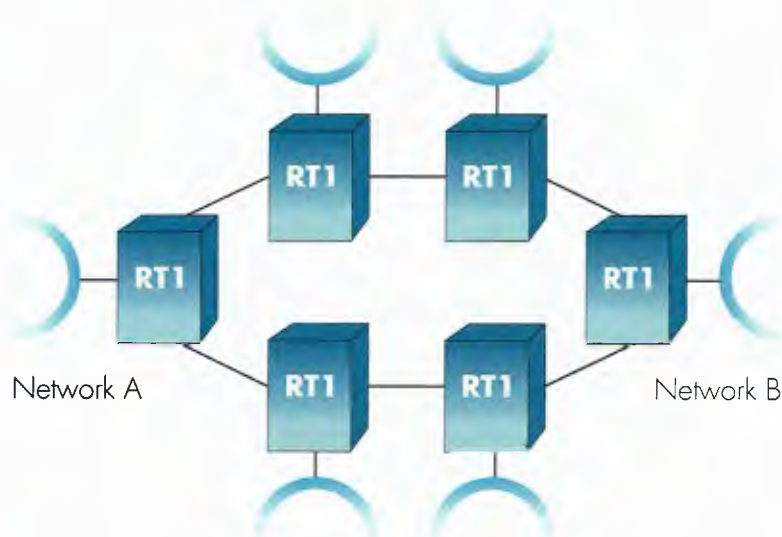


FIGURE 4. OSPF allows a network manager to create equal-cost, multi-path routes to traverse an autonomous system

protocol is minimised by the use of area border routers that handle transmissions between areas.

Area border routers originate summary link advertisements between the different areas over a predefined virtual backbone. In Figure 3, the virtual backbone is the collection of routers and links that lies outside the defined areas. In this figure, router 4 acts as an area border router to area 1. Similarly, router 11 is an area border router for area 3, while

identifying the physical topology of any area.

TYPE-OF-SERVICE ROUTING MAXIMISES LINE UTILISATION

OSPF takes advantage of the type of service field in an IP datagram (an IP datagram is the unit of information routed in a TCP/IP network). By entering a value in this field, a network manager can develop a model that may include up to eight different classes of service (Continued P16)

OSPF ROUTING CONTINUED

(From P15) (based on delay, bandwidth, and reliability) so that routers can select the data path most suited to the transmission. When several data paths exist between two points, type-of-service routing permits each path to be used for appropriate applications.

For example, you may have one path that is a satellite link, characterised by high bandwidth and the long delay associated with asynchronous links, and a second path that is a 56 Kbit/sec terrestrial point-to-point link with lower delay properties.

Using type-of-service routing, it is possible to send remote login traffic over the low-delay terrestrial link, while routing large file transfers over the high-bandwidth satellite channel.

As a result, a user performing data entry at a remote terminal would not experience the annoying two second delay related to a satellite link. Similarly, it would be possible to circumvent the bandwidth bottleneck that a terrestrial link normally imposes on file transfers.

MULTI-PATH ROUTING AND OTHER FEATURES

Multi-Path Routing allows a network manager to create equal cost, multi-path routes to traverse an autonomous system, as illustrated in figure 4. When using this capability, a router can forward data traffic across multiple equivalent paths that connect the same points, and equalise the load. The ability to share loads over multiple links provides additional bandwidth for the user.

Another OSPF feature, routing authentication, identifies the source where data originates. An OSPF datagram includes an additional field called the authentication field. Two OSPF routers can converse only if this field is set appropriately. This feature is used to prevent accidental or malicious corruption of routing information inside an OSPF-based system.

OSPF offers additional security through an external source evaluation feature, which ranks the relative trustworthiness of data sources beyond the internetwork.

The variable length subnet-masks feature allows OSPF to extend the IP subnet addressing model (whereby the range of IP addresses for a given network can be broken into subsets to create addresses for more LANs).

Each route advertised via OSPF is specified by both an IP destination and mask. This capability allows the network manager to make efficient use of the IP address space by dividing IP network numbers into multiple pieces, called subnets, of varying sizes.

OSPF IMPLEMENTATIONS

With its rich set of features, OSPF addresses many of the problems associated with older distance-vector-based protocols, such as RIP, and offers several new capabilities that address the needs of today's TCP/IP internetworks. The OSPF protocol has already been implemented by members of the TCP/IP community. In addition, several vendors have announced support for OSPF in their products.

As with any new technology, the market will determine how successful OSPF becomes. Feedback within the TCP/IP community to date has shown that the OSPF protocol does meet the need for more efficient routing capabilities in large TCP/IP networks ☐

Clustering Servers on FDDI

While no perfect configuration exists, clustering servers on a network backbone is one FDDI arrangement that has proved advantageous. It maximises the speed, reliability and cost effectiveness of this network topology and offers many additional benefits:

- Servers performance will increase because of a single 100 Mbps "pipe" connecting them.
- Latency will improve; there is only one bridge or router hop between a client requesting information and the server.
- Growing the network is simplified; adding servers or clients is easy.
- Reliability is improved as clustering servers offers built-in redundancy which improves recovery from system problems.
- Risk of unsuccessful implementations is low, with clustered servers currently installed in several sites.

Many trends, including downsizing of mainframes; emergence of the workgroup/departmental models and the concept of powerful and specialised servers have raised demand for FDDI solutions. In essence, these trends have created throughput strains on existing bottlenecks on the network in a variety of customer situations.

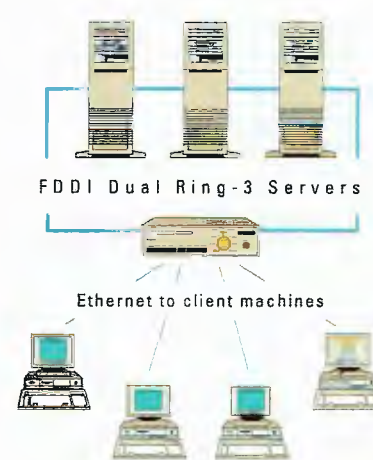
Diagram 1 displays a modern Ethernet network, segmented by bridges or routers, which is subject to latency at each segmentation point.

If a network has four or fewer servers, the servers should be attached directly to the primary and secondary rings, or dual attach, as shown below. Attaching components, including servers, in this manner provides a high degree of fault tolerance. If there is a failure in the primary ring there will be an automatic wrap to the secondary ring.

CLUSTERING ON LARGER NETWORKS

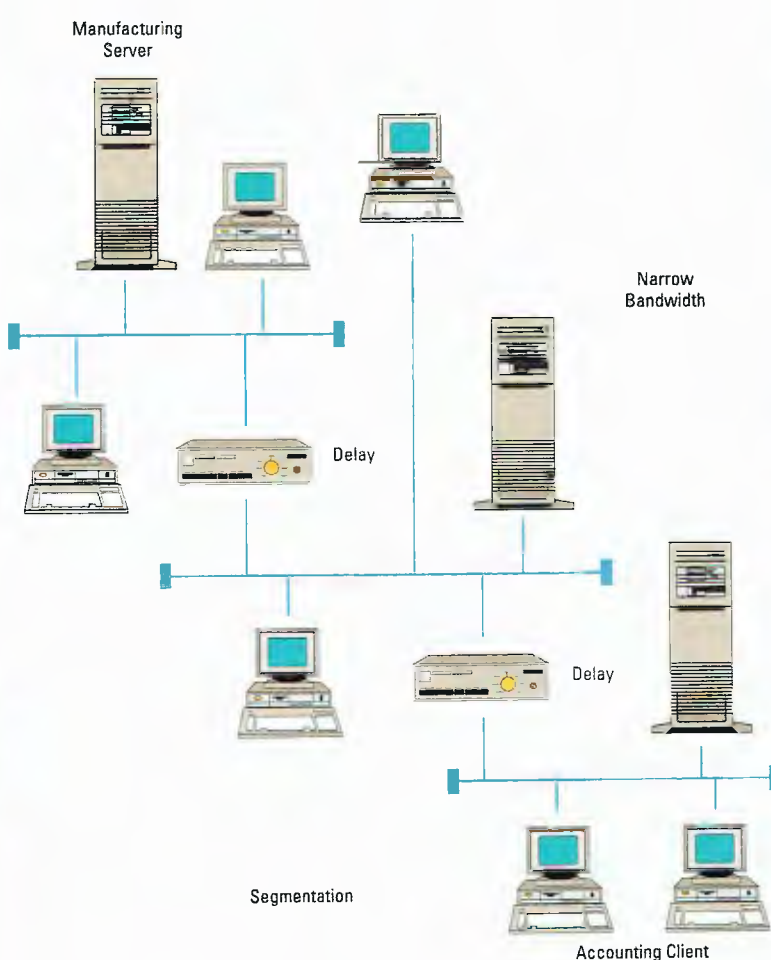
When implementing FDDI at larger sites with more than four servers, it is best to use a configuration like the one shown in diagram 3. To implement this topology, connect concentrators together on the backbone, then attach the servers to the concentrators. This arrangement has many advantages:

- **ECONOMIC:** The break-even point between putting servers on the ring or concentrators can be calculated by adding the cost of the connections under either scenario. Putting four servers on the FDDI ring will cost roughly \$3,000 per connection or \$12,000 in total which is approximately the same as the cost of a concentrator.

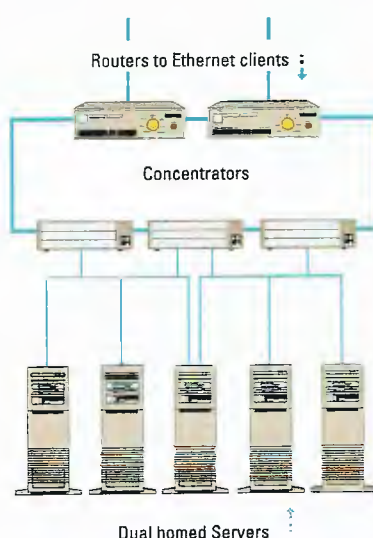


Clustering on Smaller (fewer than 4 Servers) Networks

- **EFFICIENT WIRING:** With concentrator topology, wiring comes to a single point. Thus, changes in wiring can be made easily without searching for cable connections on many devices.
- **EASY EXPANSION:** To add a new server to the ring, one simply needs to insert a new server and connect the cabling, this can be done while the ring is operational.
- **NETWORK MANAGEMENT:** There are many network management features in concentrators that aid the network manager in better operating and diagnosing the network.



A diagram of a modern Ethernet network, segmented by bridges or routers, and subject to latencies at each segmentation point is shown above.



Both clustering topologies can alleviate network congestion in server-to-server communications. Files are accessed increasingly from multiple servers. In diagram 3, for example, a user might need to access information from two servers to complete a report. Moving the servers to a common cluster expedites data transfer between servers and clients without impact to other users, increasing user productivity. Reliability is further increased because server to server traffic is isolated from the effects of any other device on the network ☐

NEED MORE INFORMATION?

For more information on any of the articles in this Newsletter, don't forget to fill out the Reader Information Request form on the back page

A little handful from Microtest

By Lazarus, The data recovery specialist

To provide the Newsletter with independent commentary, we have enlisted the support of 2 well-respected journalists. To ensure their integrity and credibility as a journalist is maintained, each has chosen a pseudonym. Lazarus the Data Recovery Specialist has extensive experience in cable design and management and provides a users view of the NEXT Scanner. Ed

One of the reasons I had such a favourable reaction to Microtest's NEXT Scanner is that it allowed me to win an argument about the future configuration of our network on Sydney's North Shore.

That apart, I also found the NEXT Scanner to be versatile, functional and easy-to-use.

To be able to fit such a comprehensive variety of test functions into something not much bigger than my old Fluke multimeter is achievement enough. To make it relatively easy-to-use, despite the fact that you can't fit too many instructions onto a keypad and a two-line screen, explains NEXT's popularity.

Within the restrictions of an 18-key front panel layout, Microtest has done very well in making the various functions of the NEXT scanner easy to access. Easy enough for most operations to be performed without resort to the manual, which I consider the acid test for any product, be it hardware or software.

The key marked "Network Setup" might intimidate the first-time user, except that there are really only a handful of options to choose from. Network type is easy to understand (Ethernet, Token Ring or Arcnet), as is speed (only in the case of Token Ring, for

selecting 4 or 16Mbps/s).

Cable type choices allow you to choose between a wide range of defaults, or specify your own cable. There are a few instrument setups to work through if you need or want to vary the user parameters of cable pairs being used, the frequency range and limits of near-end crosstalk tests (NEXT, from which the scanner gets its name), attenuation and resistance test parameters, allowable cable lengths and so on.

However, if the cabling plant has been installed to a standard design, I'd guess that there wouldn't be much need to depart from the factory parameters.

The test network I put NEXT to work on is a fairly ordinary type of site. It covers three floors of an office tower wired with 10Base-T to all desks. At the moment, there are about 75 workstations on the network, with a SynOptics 2310 hub on each floor and three file servers in the computer room.

The file servers also serve as NetWare routers to route traffic between each other, and between different floors, and an eight port dumb hub interconnects the file servers.

I decided to run NEXT's "Monitor" scan first. This test keeps a simple record of network traffic density for up to 24 hours, and was in my case useful to resolve a dispute about wiring topology for our network.

The monitor function is generated quite simply: because it is only interested in traffic density - not network or protocol analysis - it only looks at the amount of electrical noise being generated on the wire.

This information can then be

printed out as a minute-by-minute bar graph showing traffic as a percentage of the total media capacity.

While not giving any information about the type of traffic that could be causing congestion, it does give a good indication of the existence, geographical location, and time that congestion occurs.

Here's where I ran into one of the few problems I had with the scanner: the danger of rechargeable batteries.

Having run the Monitor test some distance from my printer, the easy answer was to let the unit run on battery power for the short run back to my desk. The death of the battery before I got there put paid to that. As well as the "low battery" warning that's built into the NEXT scanner, I'd suggest a key be added to bring up a bargraph charge indicator.

This was only a minor hassle, however, compared with how easy it is to get the NEXT scanner plugged in, set up and working.

The cable certification functions are so straightforward that there's not too much I can say about them, apart from that they're easy to get at and produce results that make sense to the user.

All operated from single keys, the cable certification functions include near-end crosstalk (the NEXT key), continuity (Scan key), length, attenuation, resistance and noise, while the wire mapping function ensures that terminations are correctly wired at both ends.

Resistance and wire mapping require the "Super Injector" intelligent signal injector (also needed for automatic testing which includes resistance and wire map), which connects at the far end of the signal path being tested.

Where speed is important - or where untrained personnel are used to carry out tests - the Auto Test mode offers single-button initiation of a suite of tests comprising length, attenuation in up to four frequency bands, noise in three frequency bands, resistance, wire mapping, and NEXT on all six cable pair combinations.

The printout of the auto test results shows all measurements made. Limits for all measurements are also printed out, so that the user can check each parameter against expected results, and a pass/fail decision is made by the auto test to confirm that all parameters are within the limits.

The printout is clearly presented and easy to understand. The only criticism I make of the printout of results is that Microtest have used just slightly too wide a margin for my laser printer - some details fall off the right-hand side of the page. Since I'm using a common model printer with an H.P. emulation, I'd imagine this would happen on most A4 lasers. Of course, you're not restricted to

printing out auto test results; all of them are available by scrolling across the screen.

One other function which is especially useful is the NEXT Scanner's "office finder". This test, suitable only for twisted pair sites, is performed using inserts that carry node addresses. Plugging the scanner into the cable at the wiring closet returns

the node address of the insert at the other end; hence unknown cable can be identified and marked for future use.

Overall, I found the Microtest NEXT Scanner to be a high quality and useful piece of equipment. Its sturdy construction and simple layout hide a wide range of functions, all of which are easy to access and use.

NEXT SCANNER SPECIFICATIONS

PRODUCT PACKAGING

MT340 (NEXT) Scanner
Operator Manual
Super Injector
Printer Cable
2 RJ45 cables (Low Crosstalk)
Coupler
AC adapter
Protective Cover
Plastic Carry Case

DISTANCE

Coax: Range 20 to 4,000 ft, accuracy +/- 4%, resolution 2 ft
Twisted Pair: Range 20 to 2,000 ft, accuracy +/- 4%, resolution 2ft
NVP is pre-programmed for common cable types. It can also be calibrated for non-standard cable types using a known length of cable.

SIGNAL ATTENUATION

Determines worst case attenuation on all four pairs over user programmable range, including: 256KHz, 512KHz, 768KHz, 1MHz, 2MHz, 4MHz, 5MHz, 8MHz, 10MHz, 16MHz and 20MHz. Single ended or round trip on any pairs.

NEAR-END CROSSTALK (NEXT)

Measured using Super Injector (any pair to any pair). User-programmable frequency range from 1 to 20MHz, in steps less than equal to 125KHz.
Range -45 to +0db, accuracy +/- 1dB, resolution .1dB to -30dB, .5dB-30dB to 45dB @ 100ohms.

DC RESISTANCE

Range 0.2 to 2,500ohm, accuracy +/- 0.3 ohm or +/- 2% whichever is greater.

802.3 AND 10BASE-T NETWORK MONITOR

Audio and visual indicators (bar graph).

802.5 TOKEN RING MONITOR

Use with optional RING SCANNER.

10BASE-T HUB ACTIVATION

Link test pulse generated as per IEEE 802.3 10BASE-T specifications in active hub mode.

CONTINUITY

Audio and visual indicators from 0-200ohms.

POWER

Rechargeable Ni-Cad batteries, AC charger adapter included.
Battery Life: continuous scan 3 hours, normal operation 2 weeks, low battery audio and visual indicators.
Charging Time: 14 hours to full charge, automatic power off 15 minutes after no activity.

SERIAL PORT

300 - 19,200 baud using PC compatible DB-25 connector (cable included).

DISPLAY

16 character x 2 line LCD.

PRICE

RRP \$6535.



Outsourcing: A Hit or Myth Affair

By Claudia Tweedale

"To provide the Newsletter with independent commentary, we have enlisted the support of 2 well-respected journalists. To ensure their integrity and credibility as a journalist is maintained, each has chosen a pseudonym. Claudia Tweedale's understanding of the end user market provides an innovative look at the area of outsourcing".

The business of outsourcing is not so much a new issue for the computer industry as an evolving one. Since the advent of networking technologies and the concept of distributed computing, outsourcing (the means by which computer centre operations, traditionally aligned with mainframe activities, are delegated to third parties) is being forced to shift its focus to cater for the growing industry of networking.

Back in the days when the mainframe was the centre of the computing arena, large organisations contracted out the data entry and maintenance of the computer operation.

Today, the mainframe no longer holds the centre of attention. While there are still plenty of them around, it is the network which is the centre of activity. The mainframe may be a repository for mass amounts of information, but most activity takes place else-where.

A lot of action on the desktop is being driven by user demands for greater productivity. From a technical perspective, much of what is happening involves moving information between various computer platforms. In its travels between networks, information is often required to cross numerous physical and logical boundaries.

In many ways, the challenge of 'networking in the nineties' has become a very complex issue. This is especially true for companies who need to communicate various protocols across several geographical locations.

Typically these companies will have a number of proprietary systems which hold vast amounts of information critical to the everyday operation of the company. Attached to these devices will be possibly a couple of hundred terminals linked either locally or remotely.

When the PC revolution hit, we witnessed the insatiation of stand alone PCs. What we are seeing now are PCs being hitched up to mainframes and subsequently

together in a local area network with information and resources shared as a workgroup.

Networks are being joined together to create wide area and global networks so that workgroups can share information. Likewise, terminal users are also becoming part of the overall network.

In what is known as seamless integration, anyone who is part of the network can access information from any other part of the network, security providing, without needing to how and where it is being accessed. The network is not only made up of computer platforms but can also involve a myriad of networking and communications equipment. Thus we arrive at true distributed computing.

How this all happens is a complex issue which can be discussed in more depth at some other time. Needless to say, it requires a lot of forward planning and technical know-how.

A vital question when creating the ultimate technical dream of totally seamless integration is 'who and how' the network will support.

Outsourcing and contracting mean different things to different people. The ball park is pretty broad and covers outsource management, remote processing, systems integration, software development, communications and facilities management.

Network outsourcing by contrast to mainframe outsourcing is typified by its decentralised approach. Whereas traditional outsourcing on mainframes is concerned with MVS, DB2, IDMS and CICS, today's outsourcing involves looking after not only the hardware and software components of the network. It also involves the telecommunications aspects and the interoperability of multiple platforms.

In some cases, outsourcing can be as simple as contracting out the repairs and maintenance of hardware and software systems to a third party who agrees to provide on site support within a defined period of time. This is typical of smaller organisations whose core business is not dependant on computer uptime.

At the other extreme are companies that require full

facilities management. In these cases, specialist outsourcing organisations take control of the running of the entire network on a day-to-day basis, including the responsibility of hiring personnel. In some cases, the outsourcing company may own all the equipment and be responsible for the staff, leasing back the services to the company on an annual basis.

Whether to outsource or not is really more of a management decision than a technical issue. The decision generally relates to the style of management within the organisation.

The main reason to outsource is to garner expertise for cutting costs and bolstering services which would otherwise be too expensive to cultivate within the organisation.

Not all organisations have the capital to invest in specialists. Generally large organisations do not have the time to train staff from scratch when there is an outsourcing business which can

"Not all organisations have the capital to invest in specialists."

provide someone of the calibre required who can step in at a days notice and take the reins.

Conversely, many companies are often hesitant about relinquishing control over critical internal functions and sacrificing in-house expertise. In this case, only some of the network operations will be outsourced and those which are considered critical to the core business will continue to be maintained in-house.

One of major benefits of outsourcing has been in tapping the skills of more highly trained and sometimes better compensated individuals.

The ruling decision is always cost—real and opportunity costs are involved.

The general rule of thumb is that outsourcing is considered a viable option with the contractor providing equal service for less or improved services for the same price.

Outsourcing is not temporary measure. It requires commitment. The key to its success, according

to management consultants, is rigorous planning.

Outsourcing is generally initiated by requesting suppliers to bid for the contract and providing them with guidelines.

Before examining the responses, consider the existing installation and how much it is worth both as an asset and in terms of annual its maintenance costs.

As technology never stands still, it is important to consider future plans which might include upgrades and possible migration to other platforms, operating systems, extensions to existing applications and the development of new applications as the focus of the business develops. Ensure that the medium term plans match the goals of the company as changes in technology and swapping suppliers can be costly to the organisation. They should not be undertaken unless the penalties outweigh the cost of new management.

Negotiating the contract will only be successful if it is mutually agreeable and clearly defines the performance standards to be met.

Pitfalls can be avoided by taking time to evaluate and negotiate a viable contract. This does not mean settling for the least expensive solution; it means

dealing with professional organisations. During the planning phase, it is crucial to take time to evaluate all the options being put forward by respondents. Judge the ability of the vendor to realistically meet the criteria initially set and also request justification of how they intend to meet the commitments that are being made.

The savings and benefits need to be clearly identified.

If the vendor is bidding to take over the personnel as well as the software and hardware components, human resource issues also need to be well defined.

Companies considering outsourcing need to determine the core functions of the business and look at outsourcing, in the first instance, for those tasks that are not critical. To do this, the company needs to prioritise both its IT policies and budgets, setting short and long term goals.

Outsourcing is not always the answer so it is important to watch out for the pitfalls. This applies especially when cost savings cannot

be predicted accurately and when relinquishing control poses an unacceptable risk to the rest of the business. Much of this hinges on making sure that the supplier clearly defines all the services it intends to provide.

Alternatively, some companies have been successful in creating close alliances with their hardware and software vendors and have made the decision to take all technical maintenance in-house. For those that can afford it, there are some aesthetic reasons for keeping everything under one roof.

WHOSE GETTING INVOLVED?


As the demand for network outsourcing grows, there are new types of organisations emerging that provide various degrees of packaged and tailored services. There are the traditional large system vendors, but more latterly there has been the emergence of smaller companies which focus on providing outsourcing in addition to their existing businesses. These are the resellers and value added resellers of the PC market place who, backed up by their suppliers and distributors, enhance their existing support capabilities by providing expertise in vertical markets. It is companies with this kind of experience and expertise with users which will be in the best position to service customers in the forth coming years as the number of networks increase and expand.

Typically, the company profile will be to focus on delivering and implementing open systems platforms and assisting clients with the migration process.

While mainframes still account for the lion's share of the outsourcing market, considerable growth is predicted in the LAN area.

The figures which are coming out of the US predict that revenue from outsourcing will grow by 45 per cent by 1996.

Given the current economic climate, Government is one obvious area where outsourcing is being considered very carefully. With the upcoming announcement of NSW Government's IT strategy, outsourcing is expected to be a large part of its future plans.

Likewise, this is where companies with outsourcing expertise will find the greatest opportunities 

SCO Updates TCP/IP and NFS

A host of new features have been added to SCO's TCP/IP and NFS implementations that make SCO's offering in this area far more complete. The new versions are part of SCO's recently released Open Desktop 2.0 and will ship as separate products later this month.

TCP/IP
SCO TCP/IP is an implementation of TCP/IP (Transmission Control Protocol/Internet Protocol) and related protocols for the SCO System V Operating Systems. Based on the latest functional and performance improvements of 4.3BSD TCP/IP, SCO TCP/IP has been adapted to run within the Streams framework, and with the link layer LAN card interface (LLI) of SCO UNIX and XENIX.

Added to the new version of TCP/IP is Berkeley lpd (line printer daemon) support, SNMP agent with MIB support, gated support,

bootp support, updated Telnet and Telnetd, updated sendmail, updated SLIP, PPP support and Network Time Protocol (NTP) support.

The new Berkeley Unix 4.3 lpd support is a plus for users that have a mixture of NetWare and UNIX machines. It will allow SCO UNIX to function correctly with NetWare NFS and FLeX/IP printer redirection daemons that allow NetWare print jobs to be spooled to UNIX print queues and vice versa. Berkeley lpd is also used by SUNOS, HP UX and many other UNIX/TCP implementations.

SNMP support has been added to allow the SCO TCP/IP product to be managed by SNMP managers that are MIB II compliant such as Sun Net-Manager. Managers will be able to gain a range of statistics about the various TCP/IP protocols running on a SCO UNIX or

XENIX machine.

SCO TCP/IP also now supports gated. Gated is an advanced routing protocol originally developed by Cornell University. It enables the administrator to setup the system to selectively act as an adaptive router, learning changes in network topology and status, and passing that information onto external networks.

Serial Line Internet Protocol (SLIP) and Point to Point Protocol (PPP) allow bridge and router functionality to be setup between TCP/IP networks via standard serial ports and modems. SLIP is orientated towards non-switched (leased) lines while PPP is designed for switched (dial-up) lines.

SCO NFS
SCO NFS is an implementation of Sun's Network File System (NFS) and related protocols for

operation) using only the mv or mvdir command.

NIS (Network Information Services), formerly known as NFS Yellow Pages, allows a group of systems to be administered as a single system from a single server's configuration files. This simplifies the often complicated task of administering TCP/IP networks. NIS provides an extensible database used by the TCP/NFS network for storing and accessing system information such as hostnames, network addresses, user names, and networks, along with the tools to administer that database.

The NFS Automounter is a new facility that allows remote file hierarchies (filesystems and directories) to be automatically and transparently mounted. The automount program enables users to mount and unmount remote directories on an as-needed basis.

Whenever a user on a client machine running Automounter invokes a command that accesses a remote file or directory, such as opening a file with an editor, the hierarchy to which that file or directory belongs is automatically mounted until the operation is completed and then is unmounted again.

SCO OPEN DESKTOP COMES OF AGE

Announcements from Univel, USL and Microsoft about the impending arrival of their new high powered, multi-tasking operating systems for the desktop are continuing to set the pace for the desktop market of the '90s.

SCO is the first to deliver on its promise with the launch of ODT 2.0. For SCO, this marks a significant step towards producing a desktop version of UNIX that will compete for leadership of the desktop power user stakes.

SCO Open Desktop Release 2.0 features an enhanced graphical user interface (GUI) which is based on X11R4 and the industry standard OSF/Motif Release 1.1. New features include 3D intuitive, animated drop and drag icons and new desktop accessories such mail, paint and a text editor combined with comprehensive on-line documentation.

The new release also delivers the advanced functionality of high-end workstation and server systems on cost effective, widely available Intel platforms. For scalability to larger servers, Release 2.0 supports 512Mb RAM, unlimited SCSI host adapters and disk drives larger than 1.2Gb.

In addition, Release 2.0 can be combined with SCO MPX Release 2.0 multiprocessor extension to support up to 30 processors.

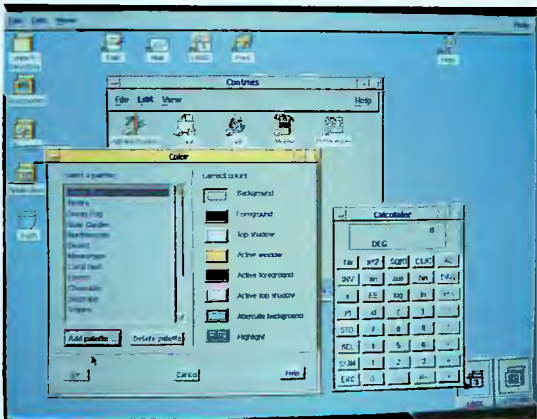
Enhanced TCP/IP and NFS services have also been provided including support for long file names, symbolic links and Network Information Services (formally Yellow Pages).

The updated version of NFS also allows ODT to properly integrate with Novell's NetWare NFS for printer re-direction and resource sharing. MS-DOS 5.0 is now supported with features such as DOS partitions larger than 32Mb, full language support and full-screen support for Windows 3.0, giving ODT users access to a wide range of Microsoft Windows applications.

SCO has substantially simplified the installation of ODT and included an intelligent upgrade program that allows the operating system to be upgraded while preserving existing hardware configurations and data.

For users of previous versions, ODT 2.0 no longer includes Ingres' relational database manager.

Open Desktop will also be packaged slightly differently with a Personal System, Server System (Personal System plus Server Upgrade) and a Development Systems being available on diskette, cartridge tape and CD-ROM.



TRAINING TRAINING TRAINING TRAINING

SCO August-September Training Schedule



SCO UNIX System V/386 Administration - 5 days			
MONTH	DATES	VENUE	RRP \$
Aug	3-7	Melb	1,750.00
Aug	31-4 Sept	Syd	1,750.00

SCO Advanced Certified Engineer (ACE) - 13 days			
MONTH	DATES	VENUE	RRP \$
Aug	3-7, 12-14, 17-21	Melb	3,900.00
Sept	31 Aug-4, 9-11, 14-18	Syd	3,900.00

* SCO UNIX courses available on request

Net + Mail Bundle

Com Tech has joined industry leaders Lotus and Novell for the first time in Australia in a major joint sales promotion that will present industry favourites NetWare 3.11 and Lotus cc:Mail as an integrated package to the PC LAN market.

Running from July 15 to September 30 1992, Com Tech is offering a fully operational ten user DOS and Windows pack of Lotus cc:Mail (value \$2 000) with all sales of NetWare 3.11 (20, 50, 100, 250 user packs).

"We are delighted to be linked with the leaders in networking and communications in this strategic promotion," said David Shein, Managing Director, Com Tech Communications.

"Novell and Lotus provide highly credible solutions to the marketplace. Novell NetWare is well established as the defacto industry standard in PC networking and Lotus cc:Mail is rapidly positioning itself as the most popular LAN-based e-mail package for PCs," he said.

"As complementary partners

in the networking arena, this joint promotion is a prime opportunity to bring the benefits of both leading edge products to the end user in one step," he explained.

cc:Mail has earned more industry awards than any other e-



mail product including Byte magazine's Readers Choice, June 1992, PC World Best Buy, September 1991, LAN Times Readers Choice Award, March 1991 and LAN Magazine Product of the Year, January 1991.

Major features include a variety of message routing configurations, Gateways to Novell, IBM, UNIX, 3COM, AT&T and others and modular architecture to provide access to the latest advances in technology. It also supports all major networking and communications standards, including Novell's Message Handling System (MHS).

Novell NetWare 3.11's new modular design offers users a significant increase in flexibility and performance. It supports all key desktop operating systems - DOS, Windows, OS/2, UNIX and Macintosh, as well as the IBM SAA environment allowing users to select workstations most applicable to the organisation's needs.

As a high performance network integration platform, NetWare 3.11 also supports multiple protocols, provides built-in routing services for IPX, TCP/IP and AppleTalk networks and offers compatibility with the myriad of third-party applications and services now available.

LANLORD OF THE NETWORK

LANlord is an integrated system for real-time, centralised management of PC workstations on LANs which enables managers to pro-actively monitor network and workstation activity and statistics and manage PC resources across multiple local and remote locations.

All applications are integrated into a single product and accessed through LANlord's Windows interface.

LANlord is comprised of three major components: an OS/2 server that collects and stores data; a non-dedicated Windows workstation that serves as the management console for using LANlord applications and a memory resident agent, located on each managed workstation.

It uses SNMP-based protocols and is compatible with NetWare 286/386. A self populating network database contains statistics and alert data, as well as information on hardware, systems and applications software, and configuration for each managed workstation. This information is dynamically updated in real-time and can be reported by physical or logical workstation groupings.

LANlord offers a number of invaluable management functions:

NETWORK MONITORING capabilities identify current or potential network problems, allowing network managers to define alert thresholds at the individual or workstation group level and request notification only when events exceed these parameters.

STATISTICS MONITORING applications collect, log and report on management data regarding workstation events to support analysis of hardware and software usage. It also provides data on current versus historical trends and planning requirements, as well as a troubleshooting/audit trail.

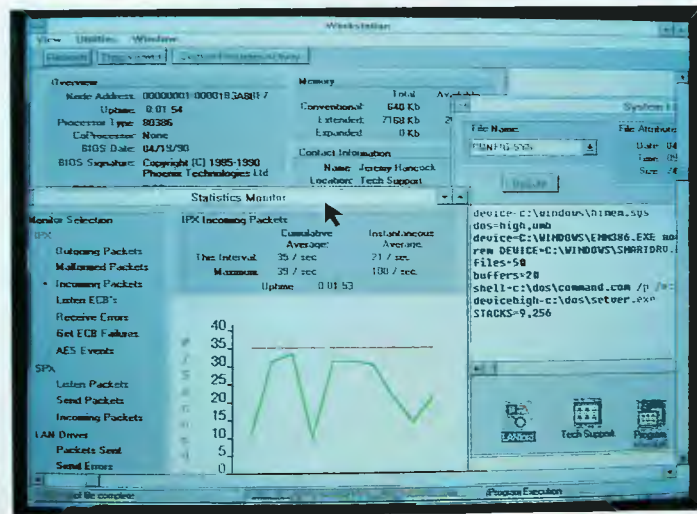
PC WORKSTATION MANAGEMENT provides the tools and information required for user support, trouble shooting and problem resolution for MS-DOS or Windows applications. It addresses issues such as PC hardware configuration and analyses performance of installed software versions including TSRs and network shells and currently running workstation applications.

REMOTE USER MANAGEMENT allows network managers to access selected files on any PC on the network from a central management console to assist in troubleshooting users problems.

SOFTWARE METERING applications allow total monitoring of application usage by server and PC workstations and includes automatic alert notification when licence limits are exceeded.

VIRUS DETECTION features allow for continuous virus monitoring and reporting.

"LANlord is a great product for network administrators because they can re-configure a PC's software, such as INI files, config.sys and autoexec.bat files from a remote workstation on the network", said Dave Jacobson, Product Manager, Com Tech Communications.



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NSW Unit 5, 37-41 Doody Street, Alexandria, NSW 2015, Tel: (02) 317 3088, Fax: (02) 693 2629, Technical Support Tel: (02) 317 3077. VIC Com Tech House, 93 Montague Street, Sth Melbourne, VIC 3205 Tel: (03) 696 0770, Fax: (03) 696 0913. QLD MIM Plaza, East Tower, Level 10, 410 Ann Street, Brisbane, QLD 4000, Tel: (07) 832 2699, Fax: (07) 832 2650. SA 1st Level, 48 Greenhill Road, Wayville, SA 5034, Tel: (08) 271 8600, Fax: (08) 373 4566. WA 4th Floor, Centerpoint Tower, 123B Colin Street, West Perth, WA 6005, Tel: (09) 322 5605, Fax: (09) 481 0447. ACT First Floor, 32 Lonsdale Street, Braddon, ACT 2601, Tel: (06) 257 7695, Fax: (06) 248 6436. A.C.N 003 371 239